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DISEASES  
OF  
THE SPINAL CORD  
AND  
ITS MEMBRANES,

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THE VARIOUS FORMS OF PARALYSIS ARISING THEREFROM,--

CHOREA AND TETANUS.



BY

CHARLES EVANS REEVES, B.A., M.D.,

SUB-GRADUATE IN MEDICINE OF THE UNIVERSITY OF LONDON, AND MEMBER OF  
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DR. EVANS REEVES

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"Nulla est alia pro certo noscendi via nisi quam plurimas  
et morborum et dissectionum historias, tum aliorum, tum  
proprias, collectas habere, et inter se comparare."

*Morgagni: de Sed. et Caus. Morb., lib. iv., præm.*

---

THE contents of the following work were originally collected as part of a plan of study laid down and carried out in connection with the examination of diseases at the bed-side, and without any view to future publication.

Some time back I was induced to send two or three articles, on two of the diseases to which the Spinal Cord and its Membranes are liable, to one of the English journals;—they were so favourably received by the Continental journals, that I felt encouraged to proceed.

The reader is requested to bear in mind, that the author aims at no higher object than to lay before

him a careful analysis of a class of diseases of which but little is known,—founded on cases observed by himself, and on those contained in English, French, German and Italian medical works.

13, HENRIETTA STREET,  
CAVENDISH SQUARE, LONDON,  
*July, 1858.*

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# DISEASES

OF THE

## SPINAL CORD AND ITS MEMBRANES.

---

### CHAPTER I.

#### ACUTE INFLAMMATION OF THE MEMBRANES OF THE SPINAL CORD.—*Acute Spinal Meningitis.*

SYN.—*Acute Paralysis from inflammation of the membranes of the spinal cord.*

VARIETIES.—1. *Inflammation of the arachnoid.* 2. *Inflammation of the pia mater.*

CHARACTERISTICS. — I. OF INFLAMMATION OF THE ARACHNOID.—*Pain in the course of the spine, generally of a burning character—Paralysis of motion, first of the lower extremities, then successively of the pelvis, abdomen, chest and arms—The sensation of the paralyzed parts increased or diminished.*  
II. OF THE PIA MATER.—*Severe pain in a part or in the whole length of the spine, greatly aggravated by motion, with rigidity and contraction of its muscles — Rigidity, contraction and pain of the muscles of the extremities supplied with nerves from that part of the cord over which the membrane is inflamed, greatly increased by motion, and aggravated in paroxysms which occur spontaneously—The cutaneous sensibility is generally increased.*

#### CAUSES.

I. PREDISPOSING.—*Sex and Age.*—Males seem to be much more predisposed to this disease than females ; for, in fifty-three cases which I have collected and observed,



thirty-nine of the number were males, and fourteen females.

In some varieties of the disease, and in some of its complications, the liability seems less pronounced on the part of males than in others. Thus, in inflammation of the arachnoid, and in inflammation of the membranes of the cord, complicated with inflammation of those of the brain, the liability was less pronounced; for, in ten cases of inflammation of the arachnoid, there were six males to four females, and in twenty-two of inflammation of the membranes of both cord and brain, there were fourteen males to nine females.

But in inflammation of the pia mater and in inflammation of the membranes of the cord, with implication of its substance, the liability was strongly pronounced on the part of males; for, in ten cases of inflammation of the pia mater alone, or with inflammation of the arachnoid, there were nine males to one female, and in seven cases of inflammation of the membranes with implication of the substance of the cord, the whole of the number were males.

The above results differ considerably from those observed by Maunthner,<sup>1</sup> who found that out of one hundred cases of inflammation of the cord and its membranes, forty-eight of the number were males and fifty-two females. The patients, it must be observed, were children.

The periods of life when the liability to acute spinal

<sup>1</sup> Krankheiten : des Gehirns und Rückenmark's bei Kinder  
Vienna, 1844, p. 415.

meningitis and its complications seem to be most pronounced are from the second to the seventh year, from the twelfth to the twentieth, and from the twentieth to the thirtieth ; for thirty-six, out of the fifty-three cases occurred during these periods—nine during the first, fourteen during the second, and fourteen during the third.

The age seems to exert some influence on the occurrence of the different forms of the inflammation. Thus acute inflammation of the arachnoid and acute inflammation of the pia mater occur, as will be seen from the following table, more frequently from the twelfth to the thirtieth year than at any other period ; inflammation of the membranes of the cord and brain from the second to the seventh year, from the twelfth to the fifteenth, and from the twentieth to the thirtieth :—

TABLE, SHOWING THE AGES AND SEX IN FIFTY-THREE CASES, AND THE RELATIVE LIABILITY OF DIFFERENT AGES TO THE VARIOUS FORMS OF INFLAMMATION OF THE MEMBRANES OF THE CORD, WITH IMPLICATION OF THE MEMBRANES OF THE BRAIN OR SUBSTANCE OF THE CORD IN FIFTY-FIVE.

	Males.	Females.	Total.	Inflammation of the arachnoid or dura mater.	Inflammation of pia mater alone, or with inflammation of arachnoid.	Inflammation of membranes with implication of cord.	Inflammation of membranes of cord and brain.
				No. of Cases.	No. of Cases.	No. of Cases.	No. of Cases.
From the 2nd to the 7th year...	6	3	9	1	—	—	8
From the 7th to the 12th year..	—	—	—	—	—	—	—
From the 12th to the 15th year	4	3	7	1	—	—	6
From the 15th to the 20th year	4	3	7	3	2	2	—
From the 20th to the 25th year	6	2	8	2	3	1	4
From the 25th to the 30th year	5	1	6	2	3	—	5
From the 30th to the 40th year	5	2	7	1	1 (aged 35)	2	1 (aged 40)
From the 40th to the 50th year	4	—	4	1	1 (aged 50)	1	1 (aged 50)
Beyond the 50th year .....	{ 50, 50, } 5 { 56, 60, } and 80 }	—	5	1	—	1	1 (aged 60)
Total.....	39	14	53	12	10	7	26

II. EXCITING.—1. *Of Spinal Meningitis with or without implication of the cord.*

The most frequent exciting cause seems to be exposure to wet and cold. It was noted as the cause in eight out of twenty-nine cases which I have collected and observed.

In one, a male, aged twenty-three,<sup>1</sup> it occurred from exposure to wet in the month of February ; in a second, a male, aged twenty-four,<sup>2</sup> from sleeping, when fatigued, in his wet clothes ; in a third, a delicate female, aged fifteen,<sup>3</sup> from over-exertion and exposure to wet ; in a fourth, a male, aged thirty-five,<sup>4</sup> from remaining several hours in his wet clothes after falling into a river ; in a fifth, a male, aged nineteen,<sup>5</sup> from exposure to cold while bathed in perspiration ; in a sixth, a male, aged twenty-nine,<sup>6</sup> from exposure to wet when bathed with perspiration ; in a seventh, a male, aged twenty-three,<sup>7</sup> from sleeping in his wet clothes ; in an eighth, a female, aged thirty-three,<sup>8</sup> after a day's washing—she had felt weak for a short time previous.

In several of the cases the patients had been liable to rheumatism. This was noted in five of the twenty-nine cases ;—in one, a male, aged thirty-five,<sup>9</sup> who, some years before, had suffered from sciatica—the inflamma-

<sup>1</sup> Albers : Jour. für Chir. und Augen. Heilkund, bd. xix.

<sup>2</sup> Myself.

<sup>3</sup> Ibid.

<sup>4</sup> Eryolles : These de Paris, 1848.

<sup>5</sup> Ducros in Clot. sur le Spinitis : Montpel. 1820.

<sup>6</sup> Myself. <sup>7</sup> Gull : Guy's Hospital Reports, 1856. <sup>8</sup> Ibid.

<sup>9</sup> Champion : Ollivier, Sur les Malad. de la Moel. Epin. obs. lxx.

tion set in after the formation of an abscess on the temple; in a second, a male, aged forty-two,<sup>1</sup> "liable to rheumatism;" in a third, a male, aged eighty,<sup>2</sup> "liable to lumbago;" in a fourth, a female, aged twenty-two,<sup>3</sup> on rheumatic pains of one week's duration; in a fifth, a male, aged nine,<sup>4</sup> who had had rheumatism, which was followed by chorea; after the latter had been cured he was taken with symptoms of meningitis.

In several cases the inflammation set in after blows, falls, or some injury to the back—tapping of a cyst which communicated with the spinal canal—or ulceration of the tumour present in spina bifida.

One or other of these causes excited the inflammation in eight of the twenty-nine cases; in one, a male, aged fifty,<sup>5</sup> from a fall, blood being effused into the spinal canal; in a second,<sup>6</sup> a male, from a blow on the back of the neck; in a third, a male, aged twenty-eight,<sup>7</sup> from a contusion of the lower part of the spine; in a fourth, a male, aged fifteen,<sup>8</sup> from a blow with the fist; in a fifth, a female, aged eighteen,<sup>9</sup> from a fall by which the seventh cervical vertebra was fractured, but not displaced; in a sixth, a male,<sup>10</sup> from a strain from lifting a heavy weight!

<sup>1</sup> Frank: *Prax. Med.*, lib. vi. 76.

<sup>2</sup> Brera: *Ceni Patholog. Cliniche sulla Rachialgite*, Mem. Medico-Cliniche: osserv. v. Pad. 1816.

<sup>3</sup> Abercrombie.

<sup>4</sup> Copland, *Lond. Med. Reposit.* vol. xv.

<sup>5</sup> Bergamaschi: *Sulla Miellet Stenica e Sul Tetano*, osserv. ix. Pav. 1820.

<sup>6</sup> *Ibid.*, osserv. iii.

<sup>7</sup> Brera: osserv. v.

<sup>8</sup> Gull.

<sup>9</sup> Simon: *Pathological Transactions*, 1855.

<sup>10</sup> Bergamaschi, osserv. ii.

in a seventh, a male, aged twenty,<sup>1</sup> from tapping a cyst which communicated with the spinal canal ; in an eighth, a child three days old,<sup>2</sup> from ulceration of the tumour in *spina bifida*.

The disease may occur on pneumonia—this was the case in a male aged thirty:<sup>3</sup> on inflammation of the kidneys—this was the case in a male aged thirty-five:<sup>4</sup> on abscesses of the kidneys, this was the case in a male aged thirty-six ;<sup>5</sup> the abscesses had been caused by calculi : on pain in the side—this was noticed in a female aged twenty-one:<sup>6</sup> on epilepsy—this was noticed in a male aged twenty-nine,<sup>7</sup> who had been liable to accesses for eighteen months:<sup>8</sup> on ulcers on different parts of the body, with a sore on the scalp, accompanied with caries of the skull, in a male aged eighteen:<sup>9</sup> on great fatigue, and exposure to a burning sun, when convalescent from fever, in a male aged seventeen : on irritation of the bowels and curvature of the spine in a child.<sup>10</sup>

It may be excited by the sudden suppression of some accustomed discharge ; it frequently occurs during the chronic form, sometimes inducing, particularly if the membranes of the brain become affected, a fatal termination.

<sup>1</sup> Tatum : *Lancet*, 1852, vol. ii.

<sup>2</sup> Dehaune et Guyot, in *Cruveilhier Anat. Path.*, liv. vi°

<sup>3</sup> Myself.

<sup>4</sup> *Ibid.*

<sup>5</sup> Bristowe : *Pathol. Transact.* 1855.

<sup>6</sup> *Cruveilhier*, liv. xxii°

<sup>7</sup> *Clot.*

<sup>8</sup> Abercrombie.

<sup>9</sup> *Bergamaschi, osserv. i.*

<sup>10</sup> Hunt : *Dublin Hospital Reports*, vol. v.



2. *Of Cerebro-spinal Meningitis.*—Nearly the same causes excite inflammation in the membranes of the brain and cord, as in the membranes of the cord alone. In some cases, the disease occurred in both situations at the same time ; in others, the membranes of the cord were first affected, those of the brain becoming subsequently implicated ; in others, again, the inflammation extended from the membranes of the brain to those of the cord.

This form of the disease seems very liable to occur as an epidemic, particularly among soldiers. The circumstances which seem to favour its development are bad food, drunkenness, mental anxiety and fatigue, combined with hot, damp, dirty, badly ventilated, and over-crowded quarters. Robust recruits, fresh from agricultural or out-of-door employments, and troops from an active campaign, or a colder climate, when brought within the influences of these causes are very liable to be seized with this form of the disease.

“ It was,” Boyle states, “ very prevalent among the English troops stationed at Sicily during the last French war. It was also frequently observed among the French troops during the wars of the Republic and the Empire, and several times since in one or other of the French garrisons, particularly at Metz, but never very extensively. From 1837 to 1842, however, it raged with more or less violence in nearly every garrison, extending in several places to the adjacent houses. It was also prevalent in the garrisons in Algiers.

In 1846,<sup>1</sup> this form of the disease appeared in Ireland. It was first noticed by Dr. Darby, in the months of May, February, and March, in the Rathdown Union Workhouse, and in April and May, in the Belfast Workhouse. It was also observed by Dr. Mayne, and Mr. Shannon in the South Dublin Workhouse. Dr. McDowel met with two cases; Dr. Law and Mr. Smyly also met with several.

It has been also observed in the New England and South-Western States of America,<sup>2</sup> by Dr. Hicks, of Vicksburg, Mississippi; Dr. Taylor of Whiteville, Tennessee; and Dr. Ames of Montgomery, Alabama.

Of twenty-one cases in which the disease occurred as a sporadic affection: in four it occurred on cerebral meningitis, which had set in during the existence of, or secondary to, measles, scarlet fever, or remittent fever—in all the cases the patients were under seven years of age; in a fifth, a female, aged fourteen,<sup>3</sup> it occurred from fright, a younger sister also died from the disease; in a sixth, a female, aged nine,<sup>4</sup> it occurred on an œdematous affection of the scalp, which had existed for five years; in a seventh, a female aged seven,<sup>5</sup> of scrofulous constitution, it supervened on the sudden cessation of a foetid discharge from the ear of some duration; in an eighth, a female, aged three-and-a-half,<sup>6</sup> on caries of the mastoid

<sup>1</sup> Mayne: Dublin Medical Journal, 1846.

<sup>2</sup> Wood, "Practice of Medicine," fourth edition.

<sup>3</sup> Jadelot et Durand: Clinique des Hôpitaux des Enfants, par Vanier, tome i.

<sup>4</sup> Hache: Jour. Hebdom. 1833.

<sup>5</sup> Jadelot et Durand.

<sup>6</sup> Myself.



portion of the temporal bone ; in a ninth, a female aged fourteen,<sup>1</sup> it set in just as favus of long standing had been nearly cured ; in a tenth, a male aged sixty-one,<sup>2</sup> it set in during peri-pneumonia which was progressing favourably ; in an eleventh, a female, aged twenty-six,<sup>3</sup> from sleeping on the ground one night in March, while intoxicated ; in a twelfth, a soldier,<sup>4</sup> from sleeping on the ground in the sun while intoxicated ; in a thirteenth, a male, aged twenty-one,<sup>5</sup> on fatigue excited by a long journey immediately after leaving the hospital, where he had been under treatment for some time for intermittent fever ; in a fourteenth, a male, aged twenty-four,<sup>6</sup> it occurred on fever ; in a fifteenth, a male, aged twenty-four,<sup>7</sup> on general rheumatism ; in a sixteenth, a male, aged thirteen,<sup>8</sup> on hemiplegia, excited by tubercles in the brain ; in a seventeenth, a male, aged fifteen,<sup>9</sup> of delicate constitution, on torticollis of a few days' duration ; in an eighteenth, a female, aged four,<sup>10</sup> labouring under tubercles of the lungs, from a fall on the forehead. In the remaining four cases no cause was assigned for the disease ; in one, the patient, a female, aged forty,<sup>11</sup> was suffering

<sup>1</sup> Hache.

<sup>2</sup> Duchatelet et Martinet: sur l'Inflam. de l'Arachnoid, observ. 137.

<sup>3</sup> Myself.

<sup>4</sup> Bielt: These de Paris.

<sup>5</sup> Fallot: Jour. Complément, tome xxxvii.

<sup>6</sup> Myself.

<sup>7</sup> Ibid.

<sup>8</sup> Leblond: Ollivier obs. 1, xxi.

<sup>9</sup> Patissier in Duchatelet et Martinet, obs. 135.

<sup>10</sup> Maunthner.

<sup>11</sup> Duchatelet et Martinet, obs. 133.

from curvature of the spine ; in another a female, aged twenty,<sup>1</sup> severe pain in the right eye had existed for eight years, in consequence of a fall on the head ; in a third, a female, aged twenty-three,<sup>2</sup> it set in fourteen days after measles had ceased suddenly.

#### CHANGES FOUND AFTER DEATH.

The vessels of the dura mater, and the cellular tissue between it and the walls of the spine, were generally gorged with blood : the cellular tissue was often the seat of serous or sanguineous effusion ; in four instances it contained pus in considerable quantities. In one of these cases the dura mater was thickened and injected ; in another, softened and destroyed at one part ; and in a third, roughened externally from inflammatory deposit.

The changes observed in the *arachnoid* were :—

1st.—Congestion, with effusion of citron-coloured or sanguinolent serum, varying in quantity from two to four ounces.

2nd.—Congestion, with opacity ; thickening ; false membranes ; adhesions between the parietal and visceral folds ; pus, more or less concrete, and forming layers of variable extent and thickness ; or sero-purulent fluid.

In the *pia mater* :—

Congestion, varying in intensity from a pale rose colour to a deep purple, with effusion of serum, lymph, or pus, between it and the arachnoid.

<sup>1</sup> Herrich : Beobacht und Untersuch ueber den rasch Verlaefenden Wasserkopf. Regensburg, 1847, 49 fall.

<sup>2</sup> Ibid, 52 fall.

With these changes the membrane was more or less opaque and thickened, sometimes adherent to the cord, sometimes separated from it by the intervention of pus in small quantities, or serum.

In the *cord* :—

1st.—Increased vascularity.

2nd.—Increased consistence.

3rd.—Softening, varying in consistence from cream cheese to soft pap, and in hue from venous red to yellow or cream white. In some cases this alteration was confined to the cortical portion and often of small extent ; in others it affected both the medullary and cortical portions, sometimes for only a short distance, but more frequently for a considerable extent.

4th.—Pus. It was very rarely observed, and when met with, it generally occurred in small collections immediately under the thickened pia mater : in two cases, however, it was observed in the cord ; in one it was contained in a distinct sac ; in the other diffused in its substance.

In the *brain and its membranes* :—

The changes observed in the membranes were, congestion of the vessels, effusion of serum into the cavity of the arachnoid, between the pia mater and arachnoid, and into the ventricles ; pus, or false membranes : in the brain, congestion, softening of the corticle or medullary substance, alone or together, of the walls of the ventricles or the central portions. In some cases tubercles were found ; more frequently, however, in the membranes than in the substance of the brain.

GENERAL SYMPTOMS OF SPINAL MENINGITIS AND ITS  
COMPLICATIONS.

*1st. Of Inflammation of the Arachnoid.*—There is generally pain of a burning character in some part of the spine, increased by motion and pressure on the sides of the spinous processes; with pain, numbness, and paralysis of motion of the lower extremities. The paralysis is the most prominent symptom, and it occurs under two circumstances. In one, from the fluid poured out gravitating towards the lower part of the canal, the paralysis commences in the feet and legs; the bladder, rectum, walls of the pelvis, abdomen, chest, and arms becoming successively affected. In some cases the paralysis is more pronounced at the onset in one leg than the other; but this is seldom of long duration, unless the result of the inflammation is the formation of false membranes which press on the nervous cords of one side more than on those of the other. When the paralysis reaches the lower part of the body the paralysis of the bladder gives rise to retention of urine, and, from implication of the sphincter ani, involuntary escape of the contents of the rectum; the latter is very apt to occur after the exhibition of drastic purgatives to overcome the obstinate constipation which sometimes exists at the commencement of the disease. When the paralysis extends to the walls of the abdomen and chest, there will be a feeling of great oppression and weight, sometimes more marked at one part than another, and causing a feeling as if a heavy weight, or a tight cord or band, were

passed round the body or chest. When the walls of the chest become paralysed, respiration will be carried on by the diaphragm, assisted by the muscles of the neck ; it will be sighing and interrupted ; accesses of suffocation will be apt to occur, particularly on motion or placing the upper part of the trunk lower than the rest of the body. The upper extremities never become so completely paralysed as the lower.

In the second form, from the results of the inflammation being the formation of false membranes, or serum or pus, bound in by adhesions, and not in sufficient quantity to press on the cord or nerves to interfere with the reception and transmission of impressions ; the paralysis may be very slight : for it is only as a mechanical cause that the effused matters in inflammation of the arachnoid produce paralysis. It is, therefore, common to find in inflammation situated in the upper part of the canal, paralysis of the lower extremities, bladder and rectum, while the only symptoms referable to the part where the inflammation exists, are pain in the spine, with perhaps some slight alteration in the sensation and motion of the parts supplied with nerves from the cord, at the point where the meningitis exists.

The paralysis of motion is almost invariably accompanied by that of sensation ; in three cases, however, the latter was increased ; in two without the pia mater or cord being apparently affected.

The muscles supplied with nerves from that part of the cord where the membrane is inflamed, are sometimes



the seat of transient shocks of pain, slight convulsions, or tremulous motions. These symptoms seem generally to occur under two circumstances: in one on motion or irritation of the parts affected; in the other from impressions (such as sudden mental emotions, or noise) received through the brain. These sensations or motions may pass either from the extremities to the cord and brain, or from the brain and cord towards the extremities. They generally prove most troublesome when the patient is about to fall asleep, or when dreaming. There is generally fever; sometimes severe if the patient is strong, and the inflammation extensive; sometimes, however, it is slight; the pulse varies; sometimes it is full and quick, sometimes weak, quick, and irregular, particularly when the walls of the chest are paralysed.

CASE I.—*From exposure to wet while fatigued—  
Symptoms of inflammation of the arachnoid—  
Cure.*

A delicate female, aged fifteen, not accustomed to exertion, came to London in 1851 to see the Exhibition. During the first two days she walked a great deal, and on her way home to her lodgings, on the evening of the second day, very much fatigued, she got wet. She passed a very restless night, and felt as if her whole body were bound tightly up in a bandage; but towards morning she fell asleep, and awoke nearly free from it. But she complained of a feeling of general lassitude, and drew her mother's attention to her feet, which felt benumbed and somewhat painful. She remained in bed

until the evening, when she got up for the bed to be made. Then she complained that her legs, as high as the knees, were benumbed, and she was scarcely able to stand. She passed a somewhat restless night, was feverish, and drank a great deal. In the morning, the legs, as high as the thighs, were benumbed and painful, the lower part of the back was also the seat of burning pain. She was now seen by a medical man, who gave her some medicine which opened the bowels, which were confined, inducing diarrhoea and inability to control the escape of their contents. The urine began to dribble away from her. At length, on the fourth day, a catheter was passed, and a large quantity of urine drawn off, and from this time it was introduced daily. She was now seen by a physician. She was cupped, and leeches were applied several times. In the course of the next twelve days she regained the power of controlling the evacuation of the contents of the bladder and rectum, and some slight power over the lower extremities. She was now brought into the country, where I had an opportunity of observing the case.

The power of motion in the extremities was still limited, they could be slightly retracted and moved on the bed, but not raised. Sensation was obtuse, and this existed as high as the trochanters. Pain existed accompanied by numbness, both were increased by motion, and lasted some time; the pulse was quick, but soft and compressible, skin rather warm, tongue red, thirst, particularly towards night, severe, urine high-coloured, pain in the lower part of the back, but of no great severity,

and unaccompanied by tenderness ; it was slightly increased by bending the back.

The cupping and the application of leeches were repeated several times, and small doses of calomel with Dover's powder given, with the effect of rendering her mouth slightly sore. From the time that this effect was produced, her recovery was rapid, and on the thirty-fifth day from the commencement of the attack she was able to walk about as usual.

CASE II.—*While fatigued—Sleeping in wet clothes—  
Symptoms of inflammation of the arachnoid—  
Cure.*

A robust carter, aged twenty-four, on the 24th of April 1850, when wet and fatigued, threw himself on some straw in his stable, and went to sleep for several hours. On awaking he felt very cold, and made great efforts to shake it off by exerting himself, but to no purpose. He passed the night suffering severely from pains in his back and limbs, and in the morning he was unable to go to work. Some Epsom salts were taken, but without effect. He was seen on the evening of the 25th. His face was anxious, flushed, and covered with perspiration, as was also the rest of his body. Pulse full and strong, skin hot, thirst severe, tongue white in the centre, but red at its edges and apex. The lower extremities were motionless and insensible, and the seat of severe numblike pain ; moving or bending them increased it. The trunk was insensible as high as the nipples. Breathing greatly oppressed, and the arms felt benumbed,



although the sensation was nearly intact. The bladder was distended, and no urine had been passed for twenty-four hours; bowels confined. The whole spine was the seat of pain, but it was free from rigidity or tenderness on pressure, although the muscles on both sides of the spinous processes were extremely tender. If he attempted to move his lower extremities the pain was increased, and painful shocks were excited, which shot up to the head. Raising him to the sitting position, caused these shocks to shoot along the sides of the chest and down the legs. The moment he fell asleep he was awoke by them, their severity causing him to utter loud groans. They seemed to arise suddenly in the spine, and shoot from thence over the body. His easiest position was with the head and shoulders somewhat raised, and avoiding the slightest movement; even speaking excited pain.

Blood to the amount of twenty ounces was taken from the arm, and with marked relief to the symptoms, and two grains of calomel and a quarter of a grain of tartarised antimony given every two hours. The urine was drawn off.

26th.—He had obtained some sleep after the bleeding. The first dose of the antimony had excited considerable nausea. The painful shocks had ceased to occur with the same severity, except on motion. They seemed to have passed into a state of tremor, which, like the shocks, was transient. The pulse being good, the bandage was removed, and the adhesions at the opening of the vein destroyed, and blood to the amount of ten

or twelve ounces allowed to flow. From this time the improvement became marked, the bowels acted without medicine, a large quantity of green fæces being passed. The mouth became sore on the fourth day of the exhibition of the calomel ; it was then discontinued. On the twelfth day he was able to get up.

The symptoms subsided in the following manner :—first the shocks of pain, then the oppression of the chest, and the numbness of the arms, accompanied by a return of the sensation of the body as low as the pelvis, then the power of evacuating the contents of the bladder, and lastly, the voluntary power and sensation of the legs.

*Of Inflammation of the Pia Mater.*—The pia mater is rarely affected without the arachnoid being either primarily or simultaneously implicated.

The most characteristic symptoms of inflammation of the pia mater are, severe pain in the spine at the point where the inflammation exists, aggravated by motion ; pain and rigidity, followed by contraction of the muscles supplied by nerves from the part of the cord where the membrane is affected. These symptoms are greatly aggravated by motion, and by the spontaneous occurrence of shocks of pain passing along the nerves. In some cases there is but slight paralysis of motion ; the patients will, however, avoid exertion as much as possible, from its increasing the severity of the symptoms : in others, on the contrary, there is marked paralysis of motion. The latter sometimes exists from the commencement of

the disease, and generally depends upon congestion of the substance of the cord, or occurs during it, from the effused matters pressing on the cord or nerves, or from softening of the cord. The existence of a considerable quantity of effusion may give rise, from its gravitating to the lower part of the canal, to some diversity in the symptoms when the inflammation is seated in the upper part of the canal. Thus the lower extremities may be paralysed both in sensation and motion, while the muscles of the neck, back, chest, and upper extremities are rigid, more or less contracted, the seat of severe pain, increased sensitiveness to touch, and affected with convulsive shocks. The skin is sometimes more sensitive than usual, particularly at the commencement, it increases as the disease progresses, until effusion or softening occurs, then it diminishes or becomes obtuse. The trembling and the transient shocks and convulsions, particularly the two last, sometimes observed in inflammation of the arachnoid, are constant in this form of the disease. They are generally very severe, and occur both spontaneously and when any attempt is made to move the affected parts ; and, if the skin is very sensitive, pinching or tickling it, or applying bodies hotter or colder than itself, will excite them. In some cases the convulsions become so severe as to affect all the muscles of the body, assuming all the appearances of tetanus, and sometimes of epilepsy.

The fever is sometimes severe, particularly if the patient is strong and the inflammation extensive or commensurate with inflammation of some other organ ; some-



times slight if the inflammation is of small extent and uncomplicated with disease of any other organ. The pulse varies, sometimes it is full and quick, sometimes weak, quick, and irregular, particularly when the disease is seated in the upper part of the canal.

In tracing the influence which inflammation of certain parts of the pia mater exerts on the muscles which receive their nerves from that part of the cord where the membrane is affected, it will be found.

*1st.*—That when the membrane of the upper part of the cervical region is inflamed the muscles of the face and jaws are affected, first with stiffness, which rapidly passes into a state of complete rigidity, rendering the jaws immoveable, and distorting the features. Sometimes the muscles are convulsed, and pain, more or less severe, exists, which is greatly aggravated by any attempt to move the jaws. The head will be also more or less drawn back, from the muscles of the upper part of the back of the neck being stiff and contracted, and the eyes, from their muscles being sometimes similarly affected, either fixed or distorted.

*2nd.*—When the inflammation extends to, or is seated lower down in, the cervical region, the muscles of the neck will present first a state of stiffness, then rigidity followed by contraction, by which the head will be drawn back or to one side, according as to whether one side is alone or more affected than the other, and both deglutition and respiration will be more or less interfered with.

*3rd.*—Implication of the membrane of the brachial portion of the cord will be characterised by rigidity and

contraction of the muscles of the arms, and of the dorsal and lumbar portions, by the same state of the muscles of the chest, abdomen, back, and lower extremities.

CASE III.—*Exposure to wet—Symptoms of lumbago—Later, of inflammation of the pia mater—Death.*

A farm labourer, aged twenty-nine, of moderate stature and strength, after exposure to wet while mowing, was taken in the evening with pain in the back. The next, and succeeding days, the pain was very severe, and prevented him from going to work; he took some turpentine and his back was rubbed with it, with some slight relief. On the morning of the third day he came under my notice as a parochial patient, suffering from what appeared to be severe lumbago. He had slight fever and thirst, bowels confined, urine scanty and high-coloured. A mustard poultice was ordered to be applied to the back, and some saline purgative medicine with colchicum, with a dose of calomel and opium at bed-time given.

4th.—He had passed a very restless night, the pain in the back had increased. It was referred to the vicinity of the lower dorsal vertebræ, and was aggravated by bending the back and striking the spinous processes with the knuckles. This led me to question him as to whether he had received any injury to the back. All that could be learnt was, that in a quarrel with one of his fellow-labourers he had received a blow, the day before he complained, which had knocked him down,

and he had rolled off a haystack ; but the height from which he had fallen was not great, and he had received no injury. There was an expression of intense anxiety about his face, which made me feel very anxious for the result of the case. He could walk, but said that it was difficult, from the pain in the back ; and when he was in the erect position he kept his hands firmly pressed on the back. His bowels had not been opened, and no urine had been passed since the day before, but the bladder was not very distended. As the state of the pulse, which was quick, but without much power, did not seem to admit of the abstraction of blood from the arm, he was cupped to eight or ten ounces from the seat of pain, with relief. A dose of croton oil was given, followed by some saline sedative medicine. The croton oil opened his bowels, and at the same time he passed about a pint of urine. In the evening he seemed somewhat better.

5th.—The night had been unusually restless. The pain had greatly extended, the lower half of the chest felt as if tightly surrounded by a band of iron, which rendered the breathing difficult. The muscles of the back felt stiff, as did those of the abdomen ; the lower extremities were somewhat rigid. The parts thus affected were the seat of severe pain, which was from time to time aggravated, particularly on attempting to move by shocks or jerks. The pain was also greatly increased by motion. The power of moving the legs seemed much restricted ; the cutaneous sensibility was intact, although deep pressure was painful. Heart's action tumultu-



ous, pulse rapid and jerking. Fifteen ounces of blood were taken from the arm, with temporary relief to the symptoms, and repeated to ten ounces in the evening with a like result ; calomel and opium were also given.

6th.—This morning the symptoms were much aggravated, the whole spine was rigid and curved, the legs were retracted, but they could be extended, although it excited severe pain ; the upper extremities were stiff, as was also the neck ; breathing greatly oppressed, and great difficulty was experienced in swallowing ; the pulse was very rapid ; heart's action very tumultuous. The blood drawn presented but a very slight buffy coat. This morning a motion was passed involuntarily, but no urine had been passed since the action of the croton oil. The bladder did not feel greatly distended ; a catheter was, however, passed, and about a pint of urine drawn off.

From time to time the back, neck, and extremities, were affected with contractions lasting for three to four minutes, causing him to utter loud groans, and the perspiration to ooze out in large drops on his face and body, from the severe aggravation of the pain which they induced.

A tobacco enema was given, but although not more than fifteen grains were used in the infusion, the symptoms which it induced were most alarming, the pulse became almost imperceptible, the heart's action feeble and tumultuous, and the surface of the body pallid. This state continued for twenty minutes after the enema had been evacuated by pressing on the lower part of the colon. It did not seem to exert any influence on the

disease further than to prevent the occurrence of the convulsive shocks. The same results followed the use of chloroform the next day.

*7th.*—The muscles of the face and jaws were now affected, the utterance of words difficult, although they were quite appropriate.

*8th.*—Breathing was still more oppressed, and rather noisy. Towards the evening a state of coma set in, and he died early in the morning of the ninth day.

The body was examined twenty-four hours after death. The vessels of the membranes and the substance of the brain were loaded with blood, the lateral ventricles contained a small quantity of serum, as did also the cellular tissue at the base of the brain.

The vessels of the spinal canal were loaded with blood, the cellular tissue between the dura mater and the walls of the spine was of a deep red. A large quantity of serum escaped from the canal, it was slightly turbid. In the lower part of the dorsal region the arachnoid membrane was somewhat thickened and opaque; between it and the pia mater gelatinous exudation existed, which extended up as high as the medulla oblongata, but its consistence and quantity was less above the sixth dorsal vertebra than below. The pia mater was deeply injected throughout, but this state also was more marked below than above the sixth dorsal vertebra.

The cord was more vascular than usual, but no other change could be observed, although it was carefully examined. The vertebræ were quite healthy.



CASE IV.—*From exposure to wet and cold—Inflammation of the pia mater and arachnoid—Death.*<sup>1</sup>

A healthy male, aged twenty-three, from exposure to wet and cold on the 1st of February, complained in the evening of pain between the shoulders extending up to the head. On the evening of the 4th, the pain became very severe: the next morning he was unable to open his mouth, and complained of severe shooting pains in the whole of the body on standing, sitting, or moving. To these symptoms severe oppression in the lower part of the chest was soon joined. The pain between the shoulders was severe and at times excited cramp-like contractions in the neck, back, and abdomen. He now entered the hospital. He was unable to walk without support, his head and extremities constantly trembling, as if he was suffering from paralysis agitans, but much stronger; the muscles of his face at times contracted and his head drawn back; it was with difficulty restored to its natural position; severe pain existed on both sides of the neck and the slightest touch aggravated the pain considerably. He was bled to sixteen ounces and the same quantity was removed in the evening, but without relief. Glauber salts and tartarized antimony were given, but without acting on the bowels. The blood was buffed; body covered with perspiration. His face ceased to be affected with contractions; it was, however, anxious, and the orbicularis oris muscle felt like a hard cord. From

<sup>1</sup> Alber's Journal die Chirurgie und Augen Heilkund, band xix.

time to time shooting pains were experienced, passing from the middle of the back to the sole of the left foot ; the oppression in the lower part of the chest and pain in the neck were greatly increased at the same time. If he attempted to move the lower extremities, or if they were touched, severe pain was excited, and they became rigid. His urine was red and plentiful, later it became milky ; his bowels were confined. He was again bled and in the evening twenty leeches and a blister were applied and a purgative enema administered, which opened his bowels, but without relief. The next day severe pain existed on both sides, from the seventh ribs to the toes ; the slightest touch increased it. The motion of the extremities was interfered with. Twelve leeches were applied, calomel and opium given, mercurial ointment rubbed in, and mustard poultices applied to the arms. In the afternoon, opisthotonos set in ; the contact of the bed-clothes with the painful parts became unbearable ; body covered with perspiration, mind unaffected, sleep impossible from the pains from the spine to the lower extremities increasing in severity the moment he dosed ; urine retained. The accesses of opisthotonos at first occurred every two or three hours, but afterwards every ten minutes. His voice was weak, speech slow and breathing difficult. Death took place the next morning. The brain and its membranes were normal. The spinal dura mater from the fifth cervical vertebra to the eleventh dorsal was red externally, internally it was of a vermilion colour, and it felt thicker than in health ; the other membranes corresponding to this part were highly injected,

the cord appeared natural, the lower part of the canal contained about two ounces of sero-purulent fluid. The left lung was of a dark red colour, and the pleural cavity of that side contained sero-sanguinolent fluid. The substance of the kidneys was red, and their pelvis contained yellow-coloured tenacious masses.

*3rd. Symptoms of cerebro-spinal meningitis.*—The inflammation sometimes commences in the membranes of the brain, those of the cord becoming secondarily affected, sometimes in those of the cord extending to those of the brain, sometimes in both at the same time. Of twenty-four cases, the membranes of the brain were first affected in thirteen of the number; in six it commenced in both situations at the same time; in five the membranes of the cord were first affected. The membranes of the brain are very liable to become affected in acute inflammation of the membranes of the cord, when it supervenes on the chronic form.

When the inflammation commenced in the membranes of the brain there was some diversity in the manner in which the symptoms appeared. In some of the cases it sets in with feelings of lassitude and indisposition, chills alternating with flushes of heat, succeeded by fever, headache more or less severe and general, agitation, delirium, flushed face, eyes brilliant and more or less intolerant of light, quick pulse ranging from 96 to 120 or 130.

In other cases, on the contrary, these symptoms were altogether absent, or so slight as to escape notice; the only indication of cerebral mischief being severe headache and a stupid expression of the face, often passing



rapidly into a state of coma. The pulse in these cases was generally slow, full, and sometimes irregular, the pupils generally dilated, the heat of the skin sometimes increased, sometimes diminished, the skin itself harsh and dry, or covered with perspiration.

The mental powers in the first class of cases were often, before the cerebral symptoms became marked, unusually active; in the latter they were often sluggish. In both, the temper was often unusually irritable, the memory defective, particularly in the second; the answers to questions, although just, were delivered slowly, but sometimes they were unusually voluble and unconnected. In some cases there was strabismus from the commencement of the disease; in others it did not set in until after it had existed for some days or towards its close. Sometimes there was paralysis of the eyelids, contraction or convulsions of the muscles of the face. The pupils varied: at the commencement of the disease they were either natural, or contracted, or dilated; sometimes they vacillated under a strong light; towards the close of the disease they sometimes became largely dilated and immoveable, sometimes very much contracted. In one case which has fallen under my notice, one pupil was very much contracted, the other largely dilated.

In some cases the patients became more or less deaf towards the close of the disease. Coma was developed rapidly in some cases, slowly in others; in some instances it was preceded by convulsions, in others the convulsions did not set in until after it had been developed.

The symptoms which marked the extension of the inflammation to the pia mater or the substance of the cord

—for inflammation of the spinal arachnoid cannot be recognised when it occurs in connection with or secondary to cerebral meningitis—were, retraction of the head, rigidity and contraction of the muscles of the neck, immobility of the jaws, difficult deglutition, oppressed or accelerated breathing, alteration or suppression of the voice, and increased or diminished cutaneous sensibility.

CASE V.—*Simple cerebro-spinal meningitis—Death.*

A prostitute of intemperate habits, aged twenty-six, entered the workhouse infirmary on the 5th of March, 1849. On the night of the 1st of March, she had, while in a state of intoxication, slept for several hours on the ground. The next day she complained of severe headache and vomiting, with pains in the back, limbs, loss of appetite, severe thirst, accompanied by a feeling of great weakness. She got up, however, and sat by the fire for the greater part of the day, but the next and succeeding day she kept her bed.

She now complained of severe general headache; her face was anxious and flushed, expression dull, pupils rather larger than natural, answers somewhat uncertain, and speech embarrassed; at times she was delirious; breathing somewhat laboured and oppressed; mouth half open, head drawn back, and the body in a state of general rigidity. This state was particularly marked in the neck and back, the arms and legs being comparatively free, but in the course of the next day they became quite as severely affected. She lay in a motionless state, any attempt to move on her own part, or to be moved, excited severe pain, and caused her to

utter piercing cries. Her pulse was rapid, 110, without much power; the deglutition of fluids, although she craved for drink, difficult; skin hot, but otherwise natural; tongue red, and protruded with difficulty. She had a chancre on one of the pudenda, and a bubo of the size of a large chestnut in the groin of the same side.

With difficulty ten ounces of blood were drawn from the arm, which had a marked effect in mitigating the symptoms. A few hours later she was cupped to the same amount, from the side of the neck. The head was shaved, and rags wetted with cold water kept constantly applied to it, and two grains of calomel placed on the tongue every two hours.

6th.—The blood drawn the day before presented but a very small amount of inflammatory coating. She had passed a very restless night, the delirium nearly constant, and from time to time she uttered loud groans. Beyond increased rigidity of the arms and legs, the symptoms had undergone no change. Her bowels had not been opened since her admission, and as the descending colon felt distended, two drops of croton oil were placed on her tongue, and with the effect of bringing away a large quantity of fæces. Eight leeches were applied to the temples, and mercurial frictions were employed, but the pain which the frictions excited rendered it impossible to persevere with them.

7th.—The early part of the night had been calm, and she had obtained some sleep, but towards morning she became very restless and delirious, uttering loud groans,



from her body being affected with frequent convulsive jerks. The vomiting, which had not troubled her since the first day, had now returned, and caused her much pain. This state continued at the time of the visit. The vomited matters consisted only of some watery mucus and particles of bile. The convulsive jerks occurred in irregular accesses, lasting for half a minute. The tincture of aconite was now given every two hours, with marked relief to the vomiting, and with the effect of mitigating the shocks.

8th.—To-day there was squinting of the right eye, and the muscles of that side of the face were contracted, and from time to time affected with convulsions. The pulse had lost much of its rapidity; the face had assumed a stupid aspect; the conjunctivæ were injected, the pupils large, light causing them to expand. Twelve leeches were applied to the temples.

9th.—The stupor had increased. She had passed a motion involuntarily.

10th.—The stupor more marked than yesterday; the cheeks livid; pulse, 90, feeble and irregular; heart's action tumultuous; the rigidity remained the same; the convulsive contractions continued to occur, but less intensely; the cries were more feeble; the skin was hot and moist about the upper part of the neck and head, but on the rest of the body cold and bedewed with clammy perspiration. She sank during the night.

*Post mortem, thirty hours after death.*—The sinus of the dura mater of the skull were loaded with black blood, and the vessels both of the membranes and brain

were largely injected ; the arachnoid generally thickened, covered with false membranous deposit ; much fluid of a turbid character existed at the base of the brain ; the lateral and other ventricles were distended with the same kind of fluid, the membrane lining them thickened, and covered with exudation, their walls more or less softened ; the septum lucidum was nearly diffuent. The brain presented no change beyond seeming somewhat softer than usual.

The vessels of the cellular tissue between the vertebræ and the dura mater were injected, the vessels of the cord and membranes generally presented the same state. The spinal canal did not contain much fluid, it having escaped when the brain was examined. The visceral fold of the arachnoid was covered with a thick layer of false membranous deposit, the membrane beneath it was strongly injected, the fold lining the dura mater was of a rose red. The cellular tissue between the arachnoid and pia mater contained gelatinous exudation and serum, and the latter membrane was deeply injected. The cord itself presented no change beyond appearing more injected than usual.

The heart, lungs, liver, and spleen, were loaded with blood ; the stomach injected ; its mucous follicles distended ; the bladder was distended with urine.

*4th.—Symptoms of Inflammation of the membranes of the cord, with implication of the substance of the cord.*

The cord seems to be more liable to become affected secondarily than simultaneously. The first took place



in seven out of nine cases: in one of the two remaining cases the cord and membranes were affected at the same time; while in the other the cord was first affected. In seven out of the nine cases the arachnoid was the membrane inflamed; while in the other two both it and the pia mater were affected.

The lesion most frequently observed in the cord was softening; this was noticed in seven out of ten cases: in two of the remaining three cases pus was found, in one instance contained in a distinct cyst, in the other diffused in the substance of the cord; in the third, the cord was indurated.

In four cases in which the time when the cord became implicated can be determined: in one it took place about the sixth day, in the second about the seventh, in the third on the eighth, and in the fourth on the tenth,

CASE VI.—*Inflammation of the arachnoid, followed by acute softening of the cord.—Death.*

A man, aged forty-six, pale and emaciated, with a scrofulous aspect, a prisoner in the Aylesbury gaol, complained, on the 3rd of December, 1848, the second day of his imprisonment, of burning pains in the lower half of the spine and pains in the limbs, with fever. He referred the symptoms to exposure to cold and wet on his way to the prison in an open cart. He had had a warm bath on his admission, and the symptoms declared themselves soon after by chilliness and intense cold along the spine. The symptoms were not strongly marked, and

attracted but little attention ; he kept to his hammock, less from indisposition than from the pains in the limbs being aggravated by motion. Some saline medicine, with colchicum and Dover's powder, was given him every six hours. On the fourth day he complained, for the first time, of inability to stand. When requested to walk, he made three or four vacillating steps along the cell, his legs then sunk under him, and he was in danger of falling. The other symptoms were the same, the bowels open, and the urine passed freely. The pains in the limbs were not severe, and they were referred to the muscles, the joints being free. The pain in the spine had not increased in severity. It was burning, and to him my hand felt cold, although the reverse was experienced by myself. The cutaneous sensibility of the right leg as high as the knee, and of the left as high as the calf, was extremely dull. When lying down they were free from pain, but on standing they felt benumbed. Voluntary motion of the ankles and feet was extremely difficult, particularly of the right extremity : but the toes could be moved, the great more freely than the others. A blister was applied to the spine, and three grains of iodide of potassium given with each dose of the mixture.

Up to the eighth, there was no alteration in the symptoms. On this day, when visited at seven P.M., he complained of severe pain in the vicinity of the last dorsal vertebræ, which radiated along the walls of the abdomen, down the inside of the thighs and legs generally, as low as the soles of the feet, where the pain was

more intense than in any other part ; the paralysis had not increased, but the fever was severe, and the pulse had risen from 84 to 96. An opiate was given.

*9th day.*—The opiate did not relieve the pains—merely deadening them. They were now less severe, as was also the fever, and the pulse had sunk to 86. No urine had been passed since the morning of the eighth day. The catheter was therefore passed, and this was done daily up to the time of death. The voluntary motion of the thighs was limited, but their cutaneous sensibility was intact.

In the evening, the pains became again very severe, and lasted until four or five o'clock the next morning, when they gradually declined. When seen at two P.M., complete paralysis existed as high as the last ribs. He felt weak and exhausted ; the pulse 72, weak and soft. This day he passed a motion involuntarily. Wine, beef tea, and quinine, were ordered.

*11th.*—He had had a slight access of fever last night, with pain encircling the abdomen, in the region of the umbilicus. It had subsided at the time when the visit was made at eleven A.M., but a feeling of constriction existed.

*12th.*—An access of fever had occurred last night, and with it the pain ; the paralysis had extended upwards to the tenth rib. An eschar, by means of caustic potash, was formed on each side of the spine. It seemed to have the effect of limiting the paralysis, for up to the seventeenth day it made no progress. On this day, after a meal of meat and potatoes, vomiting was induced,



which continued uninfluenced by the remedies given to check it, up to the nineteenth day, when it ceased. The paralysis was then found to have extended as high as the seventh rib, but it was difficult to say whether the cessation of the vomiting was due to its establishment or not.

On the twentieth day diarrhœa set in, which continued up to the time of death, everything taken passing through him in a very short time. The emaciation increased, as did the paralysis, the whole of the chest and arms becoming successively affected. The day before death the respirations were fourteen in the minute, and very weak, the heart's action feeble and irregular, voice nearly inaudible, mind intact. Death on the twenty-sixth day.

*Post mortem, twenty-four hours after death*, in the presence of Mr. Hayward. A slough had commenced to form on the sacrum.—The veins in the cellular tissue, between the dura mater and vertebræ, were loaded with black blood, and so were the sinus. A large quantity of serum escaped from the arachnoid cavity, mixed with flocculi of lymph. The visceral fold of the arachnoid, in its lower third, was thickened from the deposit of lymph. The veins ramifying on the cord were large and tortuous. The cord itself presented a motley appearance from purple spots, varying in diameter from sixpence to a shilling, existing on its surface, and extending in some instances, to several lines in depth. They were more numerous in the lower half than in the upper. The cord was of the consistence of butter, and under a stream of water broke up into minute pieces. The brain, the

lungs (which contained tubercles), spleen, liver, stomach, kidneys, and intestines, were unusually soft.

CASE VII. — *Arachnitis with subsequent implication of the cord.*

A male, aged eighteen, of scrofulous aspect, by trade a plumber. He presents a state of complete paralysis of sensation and motion as high as the eleventh ribs. The application of a hot plate to the soles of the feet excites but slight involuntary contractions of the flexor muscles of the thighs and of the glutei muscles. Both the fæces and urine are passed involuntarily, the former once a day, the latter several times, particularly in from fifteen to twenty minutes after drinking, or if he moves about on his abdomen, the position he usually occupies during the day. His appetite is good, and he has gained flesh since the paralysis became established.

The following is the history of his case :—During the last severe frost, he had been much exposed to wet and cold, which brought on pain in the lumbar portion of the back. He had been subject to the same kind of pain, from time to time, on exposure to cold. It was not, however, very intense, and did not prevent him from working. At the end of about a week the pain increased in severity, and he experienced a feeling of weakness in the ankles, which was followed by the same state of the knees, accompanied by pain and numbness. He continued, however, to get about the house with the

aid of a stick, and once he went to Westminster Hospital, a distance of a quarter of a mile, but was obliged to return in a cab. His back was several times rubbed with an embrocation, and he took some medicine, which had the effect of acting on his bowels, which were confined.

The day after walking to the hospital, the thighs became the seat of severe pains, of a gnawing and shooting character, greatly increased by motion, and they were very sensitive to the touch. These pains increased in severity, and the parts in which they were seated became affected with cramps, which soon extended to the calves of the legs, and at last ended by drawing the heels up to the buttocks. With the cramps, the parts became subject to "workings," which greatly increased the pains.

Dr. Morgan,<sup>1</sup> of Westminster, who saw the case at this time, describes these "workings" as convulsive twitchings of the muscles, the limbs were never thrown suddenly into a state of extension followed by sudden retraction. Once, when he grasped the ankle and attempted to straighten the leg during the existence of these convulsions, it was suddenly retracted. This gentleman had recourse to blisters, iodide of potassium three times a day, with calomel and opium at bed time. The pains and the convulsive twitchings gradually diminished, and with them the contraction, the limbs passing into a state of complete paralysis. This state was established

<sup>1</sup> I am indebted to this gentleman for the opportunity of seeing this case.



about fourteen days from the time he was first seen by Dr. Morgan. Fever was never very strongly marked.

CASE VIII.—*Inflammation of the arachnoid and pia mater, with implication of the cord.—Death.*<sup>1</sup>

A male, aged nineteen. Eighteen months ago he had pleurisy, followed by scarlet fever, and subsequently he complained of wandering pains in the neck and loins, with general indisposition. Three months ago he had erysipelas. He became an out-patient of the hospital for the pains. They were considered as rheumatismal and treated as such, but without relief.

On the Friday (the 4th of May) before admission, the pains became aggravated in the neck, back, and loins, causing him to scream violently, and he had a great dread of any one touching him.

On the Monday (the 7th) when he was admitted, symptoms of fever existed; the pains in the back were rather less severe; he had great disinclination to turn in bed, and when raised, an almost tetanic state of rigidity of the muscles of the neck existed; but these symptoms were not well marked until two or three days later.

On the 10th of May he lost the use of his arms for a time, then the pain left him, but re-appeared when the power of motion returned.

11th.—Convulsions came on, his features were distorted, and he foamed at the mouth; his hands were

<sup>1</sup> Dr. Bright: Guy's Hospital Reports, 1844.

clenched, and he was insensible; the rigidity of the muscles of the neck continued.

During the next day he had frequent attacks of convulsions; death. Trismus was present during the two hours which preceded death. The veins and the substance of the brain were congested.

On dividing the spinal cord, just below the medulla oblongata, some puriform-looking fluid exuded, as if from the centre of the cord, the cut surface of which was looser in texture than natural. Blood and lymph existed between the dura mater and the vertebræ; lymph and puriform matter between the arachnoid surfaces, and under the arachnoid itself, rendering this membrane slightly adherent and opaque. This opacity was seen in spots, and was evidently of recent origin; it was most observable at the fourth and fifth cervical vertebræ.

DIAGNOSIS OF INFLAMMATION OF THE MEMBRANES OF THE CORD FROM INFLAMMATION OF THE SUBSTANCE OF THE CORD.—See *Inflammation of the Substance of the Cord*.

#### TERMINATIONS.

1. *Of inflammation of the arachnoid*.—In twelve cases in which this membrane was inflamed, the termination was successful in eight of the number; of the remaining four cases, in three the disease passed into the chronic form—in neither was the inflammation very extensive; in the fourth the disease terminated fatally—the patient was only a few days old: it was excited by ulceration of the tumour present in spina bifida.



2. *Inflammation of the pia mater.*—Of eleven cases in which this membrane was inflamed, alone or in connection with the arachnoid, the result was fatal. It generally occurred in a state of coma, during convulsions, or from exhaustion after them; in one case it occurred while the patient was in a warm bath.

3. *Of inflammation of the membranes with implication of the substance of the cord.*—The termination was fatal in all the cases, seven in number. In one case, it occurred during a state of exhaustion after convulsions; in a second, from exhaustion; in a third, from general paralysis; in a fourth, from general paralysis and diarrhoea; in a fifth, from sloughing of the sacrum; in a sixth, from sloughing of the sacrum and diarrhoea; in a seventh, a child, from hydrocephalus.

4. *Of inflammation of the membranes of the brain and cord.*—The termination was fatal in all the cases, twenty-six in number. In twelve of the cases it ensued from coma, which had either supervened gradually or on convulsions; in six it occurred during convulsions; in four from exhaustion or general paralysis.

#### DURATION.

1. *In inflammation of the arachnoid.*—The duration of the eight cases which terminated successfully varied considerably, being greatly influenced by the treatment adopted, as will be seen from the following table:—

	Sex.	Age.	Treatment.	Duration.
1	Male	42	{ Bled to 1 quart, followed by the free applica- tion of leeches }	Only a few days
2	Male	80	{ Leeches and di- gitalis }	Only a few days
3	Male	24	{ Bled to 20 ozs., calomel and tartarized an- timony }	12 days
4	Male	28	{ Bleeding and digitalis }	13 days
5	Female	18	{ Repeated ab- straction of blood }	About 20 days
6	Female	11	{ Bleeding and cupping }	30 days
7	Female	15	{ Local bleeding for the first sixteen days, then mercury }	35 days
8	Female	21	{ Leeches and purgatives, the last chiefly used }	46 days

Of three cases which passed into the chronic form : in one, by cupping and blistering, the patient was able to return to her house duties in fourteen days, but fourteen days later the arms became affected ; in the second, little or no treatment was adopted ; while in the third, it was defective and employed irregularly. In the case which proved fatal, the child was ten days old when the tumour on the spine first ulcerated ; on the sixteenth day serum first escaped, then pus and death ensued on the nineteenth day.

2. *In inflammation of the pia mater.*—In the majority of the cases (seven out of eleven) in which this

membrane was inflamed, the disease lasted from seven to twelve days.

	Sex.	Age.	Duration of the disease.
1	A child	3 days	24 hours
2	Male	29 years	From 2 to 3 days
3	Male	20 "	3 days
4	Male	29 "	7 days
5	Male	29 "	9 days
6	Male	28 "	9 days
7	Male	24 "	10 days
8	Female	22 "	10 days
9	Male	19 "	11 days
10	Male	50 "	12 days
11	Male	35 "	20 days

3. *In inflammation of the membranes of the cord, with implication of the substance of the cord.*—The disease was generally of longer duration than in inflammation of the pia mater.

	Sex.	Age.	Duration of the disease.
1	Male	19	8 days
2	Male	23	13 days
3	Male	19	14 days
4	Male	35	18 days
5	Male	56	21 days
6	Male	35	23 days
7	Male	46	26 days

4. *In inflammation of the membranes of the cord and brain with or without implication of the substance of the brain or cord.*

Of twenty-two cases of this form of the disease, in two the duration of the disease was four days ; in three, from four to seven days ; in six, from seven to ten days ; in five, from ten to fourteen days ; in three, from fourteen to twenty-one days ; in three, several weeks.



## TREATMENT.

*1st. Of inflammation of the arachnoid.*—The chief reliance in the treatment of this form of inflammation must be placed on the free abstraction of blood locally and generally, and the free exhibition of mercury, both by the mouth and by inunction. In removing blood, the state of the pulse and the strength of the patient must not be considered if the paralysis is increasing. It will be seen, by referring to the table at page 43, that one copious bleeding is of more service than several small ones.

In administering mercury by the mouth, the practitioner has often a great difficulty to contend with, from the tendency which it has, in spite of opium and astringents, to run off by the bowels. When this occurs, gloves and socks or stockings saturated with the ointment should be worn ; friction with the ointment should also be employed, if the state of the skin will admit of its use.

*2nd. Of inflammation of the pia mater.*—The treatment is essentially the same as in inflammation of the arachnoid ; but it should be, if possible, more energetic, and as in it directed, rather by the severity of the symptoms than the state of the pulse and the strength of the patient.

The treatment of this form of inflammation has not hitherto been attended with success. This has, I think, arisen from its not having been sufficiently energetic ; the practitioners, guided by the state of the pulse, have hesitated, from a dread of hastening the fatal termi-

nation, to use the measures which might, if employed early and with energy, have saved the patients' lives. In most of the cases the practitioners were taken by surprise, particularly when the rigidity and contractions were not strongly marked ; when they were, the disease was generally treated as tetanus. There cannot be a doubt, I think, but that idiopathic tetanus and inflammation of the pia mater are identical. When changes are observed after death in this form of tetanus, they are those of congestion or inflammation of the pia mater, their absence being due to the too free use of tobacco enemas, and the non-administration of nourishment, causing the disease to prove fatal before the inflammatory products can be poured out. I have examined between 300 and 400 recorded cases of tetanus, and I have not found an instance in which the disease has proved fatal after salivation has been induced.

## CHAPTER II.

CHRONIC INFLAMMATION OF THE MEMBRANES  
OF THE CORD.—*Chronic Spinal Meningitis.*

SYN.—*Chronic Paralysis from chronic disease of the membranes of the cord.*

CHARACTERISTICS.—*Pain, rarely very severe, in some part of the spine—Some paralysis of motion, increased by exertion, with pains more or less severe—Cramps or contractions, and sometimes rigidity of the affected extremities—The paralysis is rarely equally pronounced in both extremities.*

## CAUSES.

I. PREDISPOSING.—*Sex and age.*—Males seem rather more predisposed to this form of the disease than females, for out of seventeen cases ten of the number were males. It does not appear to be a disease liable to occur in early life, for in only one of the seventeen cases was the patient under twenty: from the twentieth to the thirtieth year the liability is greater, for in three of the seventeen cases the patients were between these ages: from thirty to forty it is somewhat more pronounced, for in five of the seventeen cases the patients were between these ages; but the period when the greatest liability exists is from forty to fifty, for in eight of the seventeen cases the patients were between these ages.



II. *Exciting*.—It frequently occurs as a sequel to the acute form, sometimes immediately, sometimes not for months or even years after recovery. In some instances the disease is chronic from the commencement, but it is very apt to become acute, or sub-acute, particularly after over-exertion, fatigue, or exposure to cold and wet. The patients are sometimes unable to assign any reason for the disease; sometimes they consider it to have been excited by over-exertion, fatigue, severe and long-continued lumbago, blows or falls on the back, often received several months or years before the symptoms commenced; disease and injuries of the spine or its ligaments, concussion of the cord, or effusion of blood into the canal, are very apt to excite this form of the disease.

#### CHANGES FOUND AFTER DEATH.

The changes met with are, 1st, thickening of the ligaments of the spine or induration of the cellular tissue between the dura mater and the walls of the spine; 2nd, thickening of the dura mater or of the arachnoid lining it; 3rd, opacity and thickening of the visceral fold of the arachnoid, adhesions between it and the fold lining the dura mater, or between it and the pia mater, directly or by cellular bands or deposit. "These cellular bands," observes Dr. Copland,<sup>1</sup> "have, after they have existed some time, a tendency to be converted into fatty tissue." With these states there is generally congestion of the

<sup>1</sup> Dict. of Pract. Med., art. Spinal Cord.

vessels of the membranes. In some cases the alterations observed are confined to the cauda equina ; the nervous cords which form it are either bound together by considerable deposit, and separated with difficulty, or merely connected loosely by fine cellular bands. In some cases, cartilaginous or bony deposits are found, varying in number and in magnitude : they may occur as a result of inflammation or of a general tendency to cartilaginous deposit. In the latter case they are met with in persons advanced in years, and co-exist with deposit in the walls of the arteries or serous membranes. In a case observed by Dr. Bright, fifty or sixty existed ; in another recorded by Velpeau a large number were found floating on the surface of the arachnoid, and resembling minute pieces of white soap. In the latter case an encephaloid tumour existed on the anterior part of the cord. Morgagni (*De Sed. et Caus. Morb.*, epist. xxv. art. 9) found them in an old man, accompanied with ossification of the pleura. Soemmering (*Translat. of Ballie's Morbid Anat.*, Berlin, 1794, note 524) states that he had seen them several times. Lobstein (*Compte Rendu à la Faculté de Méd. de Strasbourg*, 1820-50) makes the same observation. Sabatier, he remarks, had also observed them. Esquirol (*Bul. de la Faculté de Méd.* tome ii.) observed them in an epileptic female who died during an access ; and Ollivier (*Sur les Malad. de la Moelle Epin.*, obs. lxxvi.) in a male, aged twenty-one, subject to epilepsy since childhood, who died from myelitis. The latter considers that they are common in those who have suffered from pains of a rheumatic character. They have also been observed



by Brayne, Swan, Horner, Gull, and several other writers.

I have seen a bony deposit of the size of a shilling in a bedridden man aged seventy-three; it was situated opposite the lower dorsal vertebræ; the pericardium, dura mater of the skull, and walls of the arteries, were also ossified. The spinal cord was atrophied. Barbier (*Traité Élément. de Mat. Méd.*, tome iii., 479,) found an osseous plate three lines broad and two inches long; the cord was softened; and Chaussard, (*Sur l'Organisation des Vieillards*, Paris, 1822,) ivory-like plates nearly quadrilateral in form. Fletcher (*Prov. Med. Jour.*, vol. xiv.) found them in a paraplegic male, and Rokitsky with opacity of the arachnoid; in this case the cord was softened, in the other the left corpus striatum contained an old clot of blood. Gull met with them in three instances in connection with softening of the cord. Changes are very rarely observed in the pia mater without some alteration in the consistence of the cord. In these cases it may be opaque, or thickened, and adherent to the arachnoid, either directly or by inflammatory deposit. Polletti (*Annali Univ. di Med.* xxxvi.) has recorded the case of a man who had suffered from contractions of the muscles which drew the head towards the right shoulder. The pia mater opposite the third and fourth cervical vertebræ was contracted and injected, the cord was quite healthy.

With these changes the cord may be:—1st, natural both in colour and consistence—2nd, rather more vascular than usual, the vessels ramifying on its surface

dilated—3rd, indurated, and, if the disease has been of some duration, more or less atrophied—4th, softened. The last seems to be the change most frequently observed; for it was found in seven out of fourteen cases which proved fatal.

#### GENERAL SYMPTOMS OF CHRONIC SPINAL MENINGITIS.

Ollivier considers that "dull dorsal pains, with deep numbness in the same region, and a sensation of fatigue in the extremities, indicate the existence of chronic spinal meningitis." These symptoms may exist in disease of the womb, kidneys, vertebræ, or in chronic lumbago.

It is often extremely difficult to determine whether the disease is seated in the membranes or in the cord. The disease may, as it has been before observed, occur as a sequel to the acute form, or it may be subacute or chronic from the onset.

There is generally pain in some part of the spine; in some instances dull and constant, in others slight, and felt only after exertion. It is seldom very intense, or accompanied with much tenderness on pressure, unless the vertebræ are diseased, or the roots of the nerves so involved in the inflammatory deposit as to be pressed upon. In the course of the disease, as the deposit increases or becomes organized, the motion of the lower extremities becomes interfered with. At first there is less freedom of motion, from a sense of constriction. In some cases it is only felt when the patient attempts to walk, or after he has been walking some time, be-

coming more and more severe, until it at length becomes so intense that he is obliged to desist. Numbness generally exists, and sometimes pain which follows the course of the nerves, cramps or contraction, and sometimes rigidity. These symptoms are generally excited by exertion, or, if they exist, are aggravated by it. Both extremities are rarely equally affected, neither is the sensation of the parts materially altered, unless the effused matters exert great pressure on the cord or the nerves, or softening of the cord exists.

From the effused matters seldom completely surrounding the cord, paralysis of the bladder and rectum rarely exists; the contents of the former may be passed with difficulty, or there may be slight incontinence; but as the disease progresses, particularly if softening of the cord occurs, it will become more or less paralysed, while the sphincter of the latter from the same cause will cease to be under control, or become completely paralysed.

The digestion is often interfered with, and the patients suffer much from flatulence, attacks of spasms, or great uneasiness in the abdomen. In one case the patient suffered severely from a sense of constant weight and tenderness in the hypogastric region, and at times from attacks of neuralgia of the womb and ovaries.

DIAGNOSIS OF CHRONIC SPINAL MENINGITIS FROM  
CHRONIC SOFTENING AND INDURATION OF THE CORD  
—*See softening and induration of the cord.*

TERMINATION, DURATION, AND COMPLICATIONS.

Chronic inflammation of the membranes of the cord rarely terminates fatally, unless seated in the upper part

of the cord, and not even then, unless it is extending. When it does end fatally, it is from the occurrence of some disease in itself fatal, from sloughing of the sacrum, or from acute symptoms supervening and extending to the upper part of the canal or to the brain.

In three cases which have fallen under my notice—one a female aged thirty-six, the other two males, aged forty and forty-five—the disease had lasted from four to eight years. In one of the cases it was chronic from the commencement; in the other two it had supervened on the acute.

In five other cases which have fallen under my observation death ensued at periods varying from fifteen months to four years.

The following table will show the duration, termination, and complications of eighteen cases:—

1. Female, aged 36, 3 years—the chronic supervened on the acute form; marked relief from treatment.<sup>1</sup>
2. Male, aged 40, 5½ years—the chronic had supervened on the acute form; slight relief from treatment.<sup>2</sup>
3. Male, aged 45, 8 years—chronic from the commencement; very slight relief from treatment.<sup>3</sup>
4. Male, aged 16—Death at end of 4 months, from eczema, diarrhoea, and commencing sloughing of the sacrum. The cord was softened.<sup>4</sup>
5. Female, aged 28—Death at end of 4 months, from phthisis.<sup>5</sup>
6. Male, aged 22—Death at end of 5 months, from acute inflammation, implication of the membranes of the brain, and pleuritis.<sup>6</sup>

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<sup>1</sup> Myself.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Bright: Reports of Medical Cases. Case clxxvi.

<sup>5</sup> Bright: Guy's Hospital Reports, 1836.

<sup>6</sup> Gull: Guy's Hospital Reports, 1856.



7. Male, aged 38—Death at end of some months, from acute cerebral meningitis.<sup>1</sup>
8. Female, aged 33—Death at end of 9 months, from cerebral meningitis; the cervical enlargement and the upper part of the dorsal portion of the cord were softened.<sup>2</sup>
9. Female, aged 50—Death at end of 12 months, from acute inflammation of the membranes of the cervical region and base of the brain.<sup>3</sup>
10. Male, aged 50—Death from the inflammation extending up to the cervical region, and becoming acute.<sup>4</sup>
11. Male, aged 46—Death at end of 15 months. Cord generally softened and atrophied.<sup>5</sup>
12. Female, aged 45—Death at end of 15 months, from diarrhoea and sloughing of the sacrum.<sup>6</sup>
13. Male, aged 26—Death at end of 22 months, from lumbar abscess and phthisis.<sup>7</sup>
14. Male, aged 22—Death at end of 2 years, from erysipelas of the face. Two hours before death he became unconscious, and his lower extremities paralysed. The cord was softened.<sup>8</sup>
15. Male, aged 46—Death at the end of 2½ years, from grief.<sup>9</sup>
16. Female, aged 41—Death at the end of 32 months, from diarrhoea, sloughing of the sacrum, and extension of the inflammation, which became acute. The cord was softened.<sup>10</sup>
17. Male, aged 32—Death at the end of 3 years, from abscess of the kidneys. The spine was diseased.<sup>11</sup>
18. Male, aged 50—Death at the end of 4 years, from apoplexy of the medulla oblongata. The dorsal portion of the cord was softened.<sup>12</sup>

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<sup>1</sup> Albers: Jour. die Chirurgie und Augen Heilkund, band xix.

<sup>2</sup> Gull. <sup>3</sup> Copland: Dict. of Med., art. Spinal Cord.

<sup>4</sup> Ibid. <sup>5</sup> Gull. <sup>6</sup> Myself. <sup>7</sup> Ibid.

<sup>8</sup> Rokitansky: Pathol. Anatomie. <sup>9</sup> Myself.

<sup>10</sup> Brierre: Nouvelle Biblioth. Méd., 1826, tome ii.

<sup>11</sup> Myself. <sup>12</sup> Ibid.

## TREATMENT.

The repeated local abstraction of blood, either by cupping or leeches, and the cautious exhibition of one or other of the preparations of mercury, or mercury and iodine, to induce slight salivation, if no disease exists to counter-indicate their use. The salivation should be kept up for some time. Great benefit often ensues from the repeated application of blisters; rubbing in a liniment containing one drachm of croton oil, two drachms of acetum cantharidis, and seven drachms of olive oil, or tartar emetic ointment. In some cases, when pain, cramps, and contractions are absent, much benefit often ensues from the exhibition of strychnine.

Strict rest should be enjoined, particularly if the disease is aggravated by exertion, and the formation of sores on the sacrum guarded against. When the constitutional powers are enfeebled, much benefit will ensue from the use of cod liver oil and syrup of iodide of iron, and sponging the body every morning with tepid salt and water.

Dr. Copland observes "that from the tendency which the false membranes have to become converted into adipose tissue, a marked improvement in the paralysis ensues." The same result may occur from strict rest, from the inflammatory deposit becoming partially absorbed, and from the cord or nerves adapting themselves to the pressure which it exerts.



## CHAPTER III.

ACUTE INFLAMMATION OF THE SUBSTANCE OF THE CORD.—*Acute Myelitis—Acute Softening of the Cord.*

SYN.—*Acute paralysis from acute softening of the cord.*

CHARACTERISTICS.—*Pain in the spine and painful numbness in the muscles, greatly aggravated by motion, followed by rigidity, contraction, and frequently by convulsions, and accompanied by a state of more or less marked increased cutaneous sensibility, of variable duration.—When the cervical portion of the cord is affected, there is constriction of the throat, difficult deglutition, frequent accesses of suffocation, alteration in the tone of the voice, and difficult respiration.*

## CAUSES.

I. PREDISPOSING.—*Sex and Age.*—The disease seems to be more liable to occur in males than in females; for out of fourteen cases, eleven of the number were males.

The disease seems most liable to occur from the fifteenth to the thirtieth year; for out of fourteen cases which I have collected and observed, nine of the number were between these ages: In one case the patient was only twenty-two months; in three cases between fifteen and twenty years; in three, between twenty and twenty-five; in three, between twenty-five and thirty; and in two, between forty and fifty. Of the

other two cases, one was sixty-five; the other seventy-nine.

II. EXCITING.—The most frequent exciting causes seem to be sudden exposure to cold when heated, or when convalescent from disease; sudden suppression of the menstrual discharge; and sleeping in damp beds or rooms. It sometimes occurs during continued fever, or the eruptive stage of scarlet fever, inflammation of the lungs, kidneys, brain, or membranes of the cord.

After fractures of the bones of the spine, with or without depression, or laceration of the ligaments, in which cases the cord generally receives some injury—or after concussion, or after effusion of blood into the substance of the cord, or between it and the pia mater.

#### CHANGES FOUND AFTER DEATH.

The most frequent alteration met with was softening, which varied in consistence from soft cheese to thin pap. The softened parts presented various shades of colour; sometimes they were of a rosy or purple hue, sometimes yellow (the most frequent), sometimes cream white tinged with red, or intermixed with red spots or striæ. This state of softening is preceded by a state of increased density. It is, however, but seldom found after death; for out of twenty-six cases in which the cord was either secondarily or primarily affected, it was met with in only six. In five of these six cases, the whole of the cord was inflamed, while in the sixth the inflammation was seated in the lower part of the cervical and upper part of the dorsal regions. In all of these cases except

one observed by Bergamaschi,<sup>1</sup> in which it was hardened throughout—softening existed. In another case<sup>2</sup> observed by the same author, the cervical and lumbar portions were hardened, while the dorsal was softened. In a third case, observed by Ollivier,<sup>3</sup> it was softened in the dorsal portion, but hardened in the rest of its extent; in a fourth, observed by Bouillaud,<sup>4</sup> it was softened to the extent of eight or ten lines near its upper part; in a fifth, observed by myself, it was hardened in the cervical region, but softened in the rest of its extent; in a sixth case, observed by Rokitsansky,<sup>5</sup> in which the inflammation was seated in the lower part of the cervical and upper part of the dorsal regions, “the grey substance was infiltrated with yellowish-grey exudation, yellowish-red softening—in the vicinity of the second and third vertebræ the grey matter was replaced by a spindle-shaped plug of yellow exudation, one inch long, and three or four lines thick.”

The membranes were rarely implicated; their vessels were, however, generally gorged with blood, and the fluid in the spinal canal increased in quantity.

Under the microscope the *induration* will be found to depend on the presence of the elements of inflammation (granular corpuscles) among the nervous tissue, which will be more or less destroyed; and the *softening*, on the breaking up of the granular corpuscles setting free their granules, and destruction of the nervous tissue, and sometimes of the blood-vessels.

<sup>1</sup> Osserv. ix.

<sup>2</sup> Osserv. viii.

<sup>3</sup> Observ. lxxxii.

<sup>4</sup> Journal Hebdom., 1834, tome 1.

<sup>5</sup> Pathol. Anatomie, bd. ii. 862.



A stage beyond softening is sometimes met with, less frequently, however, in the acute than in the chronic form, or after apoplexy, and generally confined to a small space. In it the granular corpuscles, granules, and broken-up nervous substance, have all disappeared, leaving only a little troubled or yellow serum, in which particles of cholesterine may be sometimes found floating.

The coloration of the softened parts is due in the red to the effusion or transudation of blood, and in the "yellow to the presence of hæmotosine;"<sup>1</sup> while in the white both are absent. In the last form a network of delicate vessels may be generally brought into view by cautiously allowing a stream of water to fall on the softened parts, in which blood partly coagulated and partly fluid will be found. Gluge enumerates pus and fat among the elements present in softening. Pus is very seldom observed: the only cases in which it is likely to be met with are those in which the inflammation is confined to a small space, or when it occurs immediately under the pia mater.

Fat globules are never observed in acute softening; but in the chronic form and in induration they are frequently met with. This seems due to a tendency on the part of the granular matter to become converted into fat. Lebert considers that the granular matter is of a fatty albuminous nature, and Vogel found that it was partly soluble in ether; its non-soluble portion consisting of some modification of protein.

Softening, it must be observed, occurs from other than

<sup>1</sup> Bennett: Inflammation of Nervous Centres.

inflammatory causes. It is met with in chorea, puerperal and other convulsions, spinal concussion, fever, cholera, scurvy, cadaveric changes, and from mechanical violence in opening the canal or removing the cord.

It is indistinguishable by the eye from softening induced by inflammation: the microscope, by demonstrating the absence of granular corpuscles, can alone determine that it is not due to inflammation. I have met with this form of softening in an infant a few days old, who, after an attack of general convulsions, suffered from irregular and sudden contractions of the lower extremities. It had had diarrhœa for some days before the convulsions set in. The mucous membrane of the intestines was found congested and ulcerated.

CASE IX.—*Concussion of the spinal cord—Death—Non-inflammatory softening.*

A stout feeble man, between sixty and seventy years of age, was tripped up by treading on a piece of orange-peel, and fell, the lower part of his sacrum striking with great force against the pavement. He became insensible, and was taken up and conveyed to Charing Cross Hospital.

He soon recovered his mental faculties, but both his upper and lower extremities were motionless. On the fourth day, from a dread of dying in the hospital, he was conveyed home, where I had an opportunity of watching the case. His voice was weak and interrupted; breathing slow; pulse soft and feeble, and heart's action weak; when asleep, the slowness of the former, the feebleness and

weakness of the latter, were still more marked. The upper and lower extremities were quite motionless and insensible; their temperature diminished. The sphincter ani was relaxed, still there was no involuntary escape of the contents of the bowels. A turpentine and gruel enema was injected; it returned on pressure being made on the lower part of the descending colon, bringing with it a little faecal matter. But very little urine was secreted; in two days not more than half a pint was drawn off. Stimulating embrocations were applied to the spine, and the day before death galvanism was resorted to, and it was thought with some benefit, for the arms seemed more sensitive when pinched. He was found dead on the morning of the twelfth day.

At the *post-mortem* examination made thirty hours after death, the cord was found of a bluish tinge, pulpy to the touch; the brain presented a somewhat similar state, but much less marked. The cord was carefully examined, but no trace of hæmorrhagic effusion could be found. The nerve fibres were unusually large and irregular, and in parts broken up, but no granular corpuscles could be discovered. The heart and the large blood-vessels contained fibrinous clots; the stomach was distended with fluid; the bladder nearly empty.

CASE X.—*Concussion of the spinal cord—Death—Non-inflammatory softening.*

An elderly woman fell down stairs and died in a few days with symptoms indicating injury of the spinal cord. The vessels of the lower part of the membranes were



turgid, and a considerable quantity of serum existed in the canal. The cord was softened from the first dorsal vertebra up to the seventh cervical, where it was pultaceous. When the softened part was examined with the microscope, the primitive nerve fibres were found destroyed, but no granular corpuscles could be discovered.<sup>1</sup>

CASE XI.—*Hysteria, after much exposure—Rigors—Stiffness of lower jaw—Cramps and pain in back—Occasional attacks of opisthotonos—Death—Non-inflammatory softening.*

A female, aged twenty-seven, stout and fat, entered the Royal Infirmary on the 29th of January, 1842. She is stated to have previously laboured under violent hysterical symptoms. During the last three weeks she had been exposed to cold and fatigue. Ten days ago she was seized with violent and continued rigors, loss of appetite, stiffness and pain of the lower jaw, followed by cramps and pain in the shoulder and back. When admitted, her face was flushed and anxious, with risus sardonicus, and a sensation as if a ball was rising in the throat; attacks of weeping and screaming from fear of lock-jaw; skin bedewed with clammy perspiration; pulse 130, of moderate strength, trismus complete; there was considerable tenderness of the maxilla and right scapula. She had occasional attacks of opistho-

<sup>1</sup> Vogel: *Icones. Pathol. Histol.*, Leipzig, 1843. 60.

<sup>2</sup> Dr. Bennett: *Inflammation of the Nervous Centres*, obs. x.

tonos ; articulation distinct. Assafœtida and morphia were given, and mercurial ointment and extract of belladonna rubbed on the spine.

30th.—Same state, but the respiration is laborious ; slight tenderness on pressure over the seventh and fifth dorsal vertebræ. Limbs are unaffected. Blister to the spine ; enemata of turpentine and assafœtida.

31st.—Slight remission.

Feb. 1st.—Great anxiety of countenance ; respiration hurried ; deglutition difficult ; otherwise the same. Tobacco enema every three hours. After the 1st, she had a violent attack of opisthotonos, during which the extremities were rigid. Head shaved and ice applied to it and the spine.

4th.—Slight amelioration. To-day the spasms returned with violence. During the 5th and 6th little change. On the 7th, she had a very severe spasm : since then the rigidity has continued ; pulse feeble, tracheal râle ; death.

The cord opposite the eleventh and twelfth dorsal vertebræ was broken down into a pultaceous mass ; no exudation corpuscles existed. The lower lobes of both lungs were much congested.

CASE XII.—*Frequent accesses of epilepsy—Coma—Death—Non-inflammatory softening.*

A female, aged nineteen, who had been subject, in consequence of fright, to epilepsy for six years, died in a state of stupor, after having had five accesses in eighteen hours.

The vessels of the head and the spine were loaded with black blood ; both the brain and the cord, particularly the latter, were injected and softened, but no inflammatory corpuscles could be discovered. The spinal canal contained a considerable quantity of red serum ; the lateral and fourth ventricles a small quantity. The colon was loaded with fæces, and the uterus contained a foetus five months' old.

GENERAL SYMPTOMS OF ACUTE IDIOPATHIC  
INFLAMMATION.

The symptoms may be divided into three stages:—  
1. That of *congestion* ; 2. That of *induration* ; 3. That of *softening*.

*1st stage, That of congestion.*—The most predominant features of this stage are pain in a part or in the whole length of the spine, with painful numbness increased by motion in the parts supplied by nerves from the point where the congestion exists, with paralysis of motion more or less marked, or extreme debility. The sensation may be intact, more obtuse than usual, or rather more exalted.

Sometimes an alteration is observed in the state of the cutaneous sensibility before the power of motion becomes affected.

When the cervical portion of the cord is affected, the breathing is difficult, deglutition more or less interfered with, and a sense of constriction or oppression exists in the throat and chest ; motion of the neck is also diffi-



cult, both from the pain which it excites and the feeling of stiffness which exists.

The voice is generally feeble, interrupted or altered, and sometimes there is ptosis, alteration of vision, or squinting. The brain seldom escapes ; there is generally severe headache, and sometimes stupor.

When the congestion is general or extensive, and particularly when it is seated in the cervical region, convulsions sometimes occur and hasten the development of the other stages.

CASE XIII.—*Symptoms of scarlet fever—Congestion of cord—Convulsions—Cure.*

A girl, fifteen years of age, was seized with symptoms indicating the approach of scarlet fever, which was then raging in the house where she resided. She had headache, pain in the back, vomiting, with slight fever, but the eruption did not make its appearance. She continued in this state for three or four days. Warm baths with diaphoretics were ordered, but without effect. She had complained throughout of a feeling of constriction in the throat. On the morning of the fifth day, she also complained of a feeling of severe constriction across the lower part of the chest, and her breathing was oppressed ; the lower extremities and lower half of the trunk were nearly motionless, and some difficulty in moving the upper extremities existed. There was pain in the spine as high as the fifth dorsal vertebra, increased by motion, but not by pressure. Pulse 90, of moderate power. A feeling of numbness existed in the paralysed

parts, but sensation seemed only somewhat more obtuse than usual in the upper extremities, while in the lower it was nearly abolished. She had never menstruated.

As the symptoms did not seem to warrant the abstraction of blood, a brisk antimonial purgative was given, and a blister applied to the back. At noon she was seized with severe convulsions of the upper and lower extremities, her body was rigid, head thrown back, corners of mouth drawn down, breathing noisy and convulsive; but she continued sensible throughout, although unable to speak. After lasting about ten minutes, the convulsions ceased. The upper extremities were found, half an hour afterwards, to be as much paralysed as the lower, and any attempt to move the latter excited severe pain. As the purgative in the morning had not acted, a dose of calomel and croton oil was given, with the effect of rapidly bringing away a large quantity of dark-coloured fæces.

At four P.M. the skin of the lower extremities and pelvis had become extremely sensitive, and she had frequent desire to pass water; only a few drops, however, being voided. The skin of the upper part of the body and upper extremities was also somewhat sensitive; the feeling of weight at the epigastrium had increased, and the breathing was much oppressed. Skin burning hot, pulse quick and full, tongue red. It was evident that active measures were necessary to save life. A large opening was made in a vein, and blood allowed to flow until fainting was produced; this was followed by the exhibition of two grains of calomel and a quarter of



a grain of tartarised antimony every two hours, and causing her to wear gloves and socks saturated with mercurial ointment. At the end of thirty-six hours, her system began to experience the effect of the mercury. The extreme sensibility of the skin began first to diminish, then the power of motion to return, and at the end of a fortnight she was well. A feeling of weakness in the lower extremities remained, and still continues, although three years have elapsed since the attack.

In a case reported by Ollivier, convulsions of the upper and lower extremities, with rigidity of the trunk, set in three days after pneumonia appeared. Paralysis of the lower extremities had existed, but the patient had recovered from it three months.

Dr. Tweedie<sup>1</sup> observed, in the case of a young lady who was in an advanced stage of fever, sudden muscular contractions of the extremities; at one time the arms were alternately thrown out and drawn back to the trunk, with great violence; while at another, contractions of the lower extremities took place. They ceased almost immediately after the abstraction of a large quantity of blood from the spine.

In another case, observed by Ollivier, the patient had been subject to epilepsy since youth, and the development of the inflammation was accompanied by an access.

Portal<sup>2</sup> mentions the case of a fat strong female who experienced severe convulsions of the left lower extremity

<sup>1</sup> Art. Myelitis, in *Encyclop. Practical Medicine*.

<sup>2</sup> *Anat. Médicale*, tome iv. 116.

each time the menses were about to appear, ceasing only when they flowed in considerable quantity. The menstrual discharge ceased about forty, then this extremity became quite paralysed, convulsions of the arm of the same side set in, and she died at last in a state of coma. The membranes of the cord were found congested, and the cord in its left half was red and softened, the right being quite healthy.

*2nd stage, That of induration.*—The symptoms in this stage, as in the former, will present some modification, according to the extent of the disease, and the degree of irritation which it excites ; for if the disease is confined to a small space, and excites but little irritation, they may be but slightly marked, or even absent.

When the disease is seated in the cervical portion of the cord, the muscles of the eyes, face or neck, are more or less affected with rigidity, contractions, and convulsions ; there is also, when the muscles of the last situation are affected, constriction of the throat, difficult deglutition and respiration, and alteration of the tone of the voice. The patients are liable to accesses of suffocation, which may occur spontaneously, or on drinking hurriedly, particularly cold fluids.

When the disease is seated low down in the cervical region, or in the upper part of the dorsal, the arms are first affected with rigidity, followed by contraction, which sometimes affects the whole arm at the same time ; but sometimes the fingers, hands, forearms, and arms,—or the arms, forearms, hands, and fingers,—are affected in succession. In some cases the rigidity and contraction

occur gradually ; in others they are excited and aggravated by the convulsive shocks. Both arms are not always affected at the same time, or in the same manner, or in an equal degree. One is sometimes rigid, contracted, more or less convulsed and sensitive ; while the other is but slightly affected, or only paralysed in motion and sensation. The arms are more or less paralysed in motion and sensation, even when the disease is seated some distance below the point where the nerves which assist to form the brachial plexus are given off.

When the dorsal and lumbar portions of the cord are affected ; the muscles of the back, chest, abdomen, and lower extremities are more or less rigid, contracted and convulsed ; the breathing is more or less interfered with, either from a sense of general oppression of the chest, or from a feeling as if a band or cord were bound tightly round it ; the bladder is often unusually irritable, and the bowels confined. The pain, rigidity, contraction, and convulsions, are always more marked in the lower extremities than in the upper.

The cutaneous sensibility of the parts affected is increased, sometimes to such an extent that the slightest touch—sometimes even a current of air—excites pain, and sometimes convulsions. These convulsions usually occur spontaneously, and sometimes become general ; but grasping the affected extremities, attempting to extend them, pinching, or drawing a feather over, the skin, will excite them, and if the cutaneous sensibility is much increased, and the cord generally or extensively inflamed, even excite general convulsions. The convulsive shocks



and the convulsions greatly aggravate the pain. Fever is generally present, but it is seldom very severe, unless the inflammation is extensive; the pulse is sometimes quick and hard—sometimes quick, soft, and irregular; in inflammation of the cervical portion of the cord it is often not quicker than natural, it may be even slower.

*3rd stage, That of softening.*—The parts hitherto the seat of pain, convulsive contractions and increased cutaneous sensibility, now become motionless and insensible. Sometimes, from the softening not being complete, the parts are still affected with convulsive agitations, which may, if convulsions occur in any other part of the body, be increased, and the last may sometimes assume all their former severity.

The state of flexion sometimes subsides; when it does continue it seems to depend rather on a state of contraction of the muscles than upon any influence exerted by the cord. In some cases it can be overcome without much force, the parts returning to their former state as soon as the force is removed, while in others they remain as they are placed. The pulse becomes weaker than it was in the other stage; the bladder and rectum, if not before, are now generally paralysed, and the strength fails.

This stage sometimes exists without being suspected, the other stages being equally unrecognised; this is particularly the case when the dorsal region is the seat of the disease. In a case observed by Dr. Antonini,<sup>1</sup> the

<sup>1</sup> Petronelli: Thèse de Montpel., 1826. No. 83.

only symptoms referable to the cord were, cramps in the legs, and severe pains in the joints on the slightest motion, with frequent desire to go to stool, and inability at first, and then constant desire to pass water. Death ensued from yellow fever. The cord opposite the sixth dorsal vertebra offered a state of complete separation nine or ten lines anteriorly, and one inch and a half posteriorly; the space was filled with yellow serum slightly troubled. The corresponding points of the destroyed cord were softened in an extent of one or two lines.

In a case which has fallen under my own notice, the cord was softened in the dorsal region, and yet the only symptoms observed during life were retention of urine, and pain, not of an intense character, in the back, increased by motion.

This stage is frequently alone recognised, particularly when the cord becomes secondarily affected, or when the inflammation is excited by fracture of the vertebræ with depression, laceration of the cord, or effusion of blood into its substance, or between it and the pia mater; the other two stages being absent, or so slight as to escape notice.

CASE XIV.—*Pleuritis, followed, on exposure to cold, by general congestion and subsequent inflammation of the cord—Death.*

A servant girl, aged eighteen, strong and stout, was seized, on the 12th of February, 1847, with acute pleuritis. By active antiphlogistic treatment the symptoms were soon subdued, and she was able to get up in



the course of a week. She then insisted on going home, a distance of three miles, in spite of all that could be urged against it. During the journey, although well wrapped up, she suffered severely from cold, and, when taken out of the cab, was benumbed and nearly stupified. She was put into a warm bed, and warm drinks were given ; but some hours elapsed before the natural heat of the skin returned. When it did, she complained of severe pain along the whole course of the spine, great oppression at the chest, and pains in the head, legs, and arms.

When seen early the next morning, she complained of painful numbness in the upper and lower extremities, and was unable to lift them off the bed ; deep-seated weight in the lower part of the chest, and obtuse pains in its sides ; slight difficulty in swallowing, with a sense of constriction in the throat ; breathing oppressed ; sensation of the skin, and mental faculties, intact ; pulse 100, without much power ; bowels confined ; no tenderness along the spine. Saline purgatives, with colchicum and small doses of calomel and Dover's powder, were ordered. In the evening the heat of the skin had greatly increased ; face flushed ; the surface of the body generally sensitive ; motion of the jaws difficult and painful, and moving the limbs on the bed the same. During the day she had had several attacks of suffocation, and once, when some cold water was given her, she was in danger of being suffocated. The fingers and toes were flexed, and the back and neck rigid. The bowels had not been opened ; she had passed water fre-

quently, still but little had been voided. Blood to the amount of ten ounces was taken from the arm, twelve leeches applied to the spine, and a dose of croton oil given, followed by calomel and opium. The bleeding was followed by marked relief, and she obtained several hours' sleep. The next day she seemed somewhat better; the attacks of suffocation, and the pain and sensitiveness, were less marked. The bowels had been freely opened. The blood drawn was rather buffed.

The pulse was 110. Blood was again taken from the arm; the calomel and opium were continued.

During the next five days she continued much in the same state. The calomel had not induced salivation; the use of mercurial friction was impossible, from the pain it excited; the pulse ranged from 96 to 106, but without much power. She was seen twice by Dr. Anthony Thompson.

Early in the morning of the sixth day she awoke after a few minutes' sleep, and uttered a piercing cry; her body became stiff, and affected with convulsive shocks, her legs being moved up and down in the bed; her arms were drawn up, her breathing hurried, jaws firmly closed; she was sensible. This state lasted for a quarter of an hour, and then gradually subsided, leaving her weak and exhausted, with her body covered with perspiration. During the attack she passed both urine and fæces involuntarily.

When seen three hours afterwards, the lower extremities were in a state of resolution and insensible. This state extended up as high as the tenth dorsal vertebra.

Tickling the soles of the feet induced slight agitations. The cutaneous sensibility of the walls of the chest, as high as the chin, was increased; but it was more marked below than above the clavicles; that of the fore-arms was in the same state. The latter were flexed and rigid—the slightest attempt to extend them excited severe pain; from time to time they were affected with contractions, which also excited severe pain,—which extended to the sides of the chest. The muscles of the jaw were stiff, and those of the neck the same; voice feeble; pulse weak and jerking; heart's action the same; breathing difficult.

During the next twelve hours the symptoms increased in severity, and, while attempting to drink a little water, she was seized with a sensation of suffocation, and died in a few minutes.

It was not until the fourth day that permission could be obtained to examine the body.

*Post Mortem.*—The brain and its membranes were more vascular than usual, and a little fluid existed at its base. A considerable quantity of red serum escaped from the spinal canal; the vessels of the cellular tissue, between the dura mater and spine, were highly congested, as were those of the membranes. The membranes generally were of a deep rose hue; the cord was also tinged of the same hue. The latter, from the eighth dorsal vertebra downwards, was softened; it was less marked above this point, as high as the first dorsal vertebra; above this, as high as the fourth cervical vertebra, a state of induration, not strongly marked, existed.

Examined under the microscope, the parts where the greatest degree of softening existed presented globular corpuscles, granules, and broken-up nerve fibres. In the part where this was less marked, globular corpuscles were more plentiful, the granules fewer, the nerve fibres varicose and broken. In the part where the hardening existed, granular corpuscles, intermixed with the nervous substance, were found.

CASE XV.—*Congestion of the cervical portion of the cord, followed by inflammation, which subsequently became general—Death.*<sup>1</sup>

A lad, aged fifteen, health good. During the last six months he had slept in a damp room. He was first taken ill on the night of the 11th of February, but, by bleeding and leeches, was able to return to his occupation as a goldsmith on the 17th. But on the 19th he relapsed, his arms were benumbed, he could not hold his tools, and for a quarter of an hour he was insensible. He slept well the next night, and the following day he felt better. His hands were convulsively flexed. Purgatives were given, followed by sedatives, with friction to the limbs.

On the 26th, 27th, and 28th, he was pretty well, but he was seized in the night with a severe access of suffocation, and with cramps in his limbs. He had several attacks during the night, and the next day they were nearly constant. Since the commencement of the disease, he has from time to time suffered from palpitation of the

<sup>1</sup> Bouillaud: *Journal Hebdom.*, tome i. 1834.

heart. Entered the hospital on the 1st of March. When seen on the 2nd, his face was flushed, eyes fixed, mind intact, and answers perfect, but voice trembling, and interrupted by groans, from pains in his limbs, and suffocating sobs. Fingers, hands, and forearms were strongly flexed, and the toes and feet were similarly affected. The muscles on the anterior part of the upper extremities, and those on the posterior aspect of the lower, were strongly contracted. Those of the abdomen, and the masseters were equally affected. The jaws were with difficulty separated. The contraction of the muscles, and the pains, were increased during the accesses. If the members were extended or the larynx rubbed when they were present, he felt much relieved. Pulse 116, heart's action strong and rapid.

He was bled from the arm, and fifty leeches applied to the spine ; musk and opium internally, with enemata. Warm baths, with cold effusion.

Some slight amelioration followed the bleeding ; half an hour afterwards he was placed in a warm bath for half an hour, and then into a cold one for the same period. He was much relieved, and in half an hour he was free from pain, and the accesses of suffocation ceased.

At noon fifty more leeches were applied to the spine.

3rd, 8 A.M.—The accesses of suffocation and the cramps in the superior extremities had returned since 7 A.M., but less severely than the day before ; the lower extremities were supple, and he could move them ; pulse 90 to 100, skin warm and moist. Constipation. He was



bled, with relief; thirty leeches were applied to the spine; musk and opium internally. In the evening he was free from pain; passed a good night, and made water freely.

*4th*, 7 A.M.—Warm bath. At 8, more muscular rigidity, and slight contraction of the jaws.

The blood drawn was not buffy, and the clot was of but slight consistence. Continued medicines and bath. He passed a tranquil day, but in the evening, having drunk rather hastily, the suffocation returned.

*5th*, 8 A.M.—The suffocations continued, particularly when he drank; from time to time he had cramps in the thoracic extremities; more permanent contraction existed, but the lower extremities continued supple. No sweats; tongue white and dry; thirst; no action of the bowels for three days; face altered; pulse 108.

Scarifications of the upper part of the spine. By mistake he had a cold bath for half an hour; the cramps and the suffocations did not cease while he was in it.

After he came out, bottles of hot water were applied to the feet; he was calmer for some hours, although he felt icy cold. He slept pretty well; he passed water in the bath, but in the evening it was necessary to use the catheter.

*6th*.—The contraction of the muscles had returned with violence. The accesses of suffocation were severe, but principally during the deglutition of liquids; bladder distended; sweats; twitchings of the tendons; pulse 120 to 124. Bled and leeches.

Death at 11 A.M. in an access of suffocation.

*Post mortem, twenty-four hours after death.*—Marked injection, external to the dura mater of the cord. On opening the membranes a considerable amount of fluid made its escape, particularly from the cervical region. The anterior and posterior faces of the cord, and the cauda equina, were of a rose hue. The substance of the cord, particularly on its anterior face, had considerably increased in consistence, and towards its superior extremity on the anterior half for a circumscribed space eight or ten lines in length, was softened, and of a creamy consistence, and yellowish-red hue. The medulla oblongata and the annular protuberance were livid ; the brain was healthy, but the veins and sinuses, and also the choroid plexus, were injected, and the two lateral and fifth ventricles contained a little serum ; the pericardium contained nearly two ounces of pus. No other lesion was discovered.

CASE XVI.—*Feebleness of the lower extremities accompanied by diarrhœa, consequent on convulsions ; cure—Relapse ; cure. Three months later, pneumonia followed by general myelitis—Death.*<sup>1</sup>

A male child, aged twenty-two months, was taken with diarrhœa in the first week of September. When seen fifteen days later by M. Billard, he was labouring under violent fever ; face pale, frequent liquid motions, yellow and frothy ; slight stupor existed, with feebleness of both legs, which yielded with pain under the weight of his body, but they preserved their sensibility. This incomplete paralysis had supervened after convulsions, and

Ollivier : Observ. lxxxii.

had occurred at the same time as the diarrhœa. Under treatment the diarrhœa disappeared at the end of four days, but the other symptoms continued. By the 1st of October he had recovered his appetite and natural colour, but not his gaiety. By friction to the spine and the subsequent application of two blisters for a short time, he was enabled to move first the great toe, and then the foot, of the right side. This was his state when I saw him in company with Dr. Guéssin, on the 15th of October. A stream of warm water, strongly impregnated with salt, was allowed to fall twice a day, from a height of eight feet, on the spine.

After each douche he was placed in a warm bed, by which copious perspiration was induced. At the end of six days he could move the right foot and leg, and at the end of a month greater power of movement existed, but he could not stand. Frictions to the spine were alone used in the first half of November; but in the second the water was again employed, and with the best effect: he could sustain himself on his legs, and, by support under the arms, walk.

During December the improvement continued under the use of the water; but the left leg was rather more sluggish than the right. He began to walk in the commencement of January, with the assistance of his mother's finger. On the 20th of January, he was suddenly seized with watery yellow diarrhœa, the abdomen was tense, and painful on pressure; the pulse was greatly developed, skin hot and dry, and the tongue white. The water was discontinued. Four leeches were applied around

the anus, and demulcents given. In three days all the symptoms had disappeared with the exception of the diarrhœa, which yielded on the exhibition of a few drops of laudanum in rice-water, for a few days, and his health was quite restored. The legs had, however, become again paralysed.

By returning to the use of the douches, by the end of February he could walk and run with ease, although there still existed slight lameness, due to feebleness in the left leg; but even this at last disappeared.

Three months later, on the 25th May, he was seized with pneumonia, which was combated energetically; but on the night of the 28th, convulsions of the superior and inferior extremities set in, with rigidity of the trunk, trismus, and contortion of the mouth. The convulsions ceased, but the lower extremities remained paralysed as to motion, but very sensible and painful; for a slight pinch, or simply displacing one of the limbs, caused him to scream. The pneumonia increased.

30th.—The pneumonia had increased, and he suffered from pain in the head, and was much agitated, but the legs remained motionless, the skin was hot, pulse full and quick.

In the night of the 31st, convulsions like the last again set in. The upper and lower extremities, the lips, the nostrils, the eyelids and the eyeballs, were affected with convulsive motions. During the convulsions, if the legs were touched, they were removed by a sudden jerk. These convulsions lasted two hours; he did not lose consciousness. The legs afterwards remained motionless,

and only preserved their ordinary state of sensibility. In the morning he complained only of his head and legs.

The 3rd and 4th of June were passed in the same state. The fever continued high. In the night of the 4th, the convulsions reappeared.

When seen at 5 A.M., he presented the following state : face pale and contracted, eyes open and fixed, pupils very much dilated, convulsive motions of the muscles of the face and eyes ; trismus, rigidity of the trunk, constant motion (flexion and extension) of one or other of the legs and of the arms, involuntary discharge of urine ; abdomen soft, pulse small and irregular ; loss of consciousness for an hour only. Six leeches were applied to the angle of each jaw ; cold water to the head and along the spine. The convulsive movements of the face ceased suddenly, consciousness returned, but the convulsive motions of the legs and arms continued another hour, when they diminished, and at the end of two hours ceased. The child complained of the head, and the left arm and lower extremities remained motionless. An access occurred two hours later, but with less intensity. The night of the 5th was passed in a calm state.

6th.—Sudden and passing shocks in the arms and in the legs—complete paralysis of motion in the latter. In the left arm motion was very limited, but it was more extensive in the right ; sensation continued ; pulse feeble. In the evening general perspiration ; respiration laboured. He fell into a state of profound coma, and died in four hours.

*Post Mortem.*—Considerable effusion of blood was found between the dura mater and the vertebræ, parti-



cularly in the lumbar region. In the vicinity of the two first lumbar vertebræ and the last dorsal, the dura mater appeared thickened, and remarkably hard; its colour, where it was in contact with the blood effused, was red. This thickening occupied its whole extent. In the interior the membranes of the cord offered no change. The substance of the cord in its lumbar portion was softened, semi-fluid, and yellow, mixed with striæ of blood. After directing a stream of water on this part for ten minutes, there remained only a network of vessels gorged with blood. Opposite the eighth dorsal vertebra, the cord presented a firmness contrasting strongly with the softening below; it affected equally the anterior and posterior part of the cord. When incised, it offered a smooth polished surface. The medulla oblongata and the annular protuberance were equally resistant. A little fluid was found in the ventricles of the brain. The upper and lateral part of the lung was hepatized, and the bronchia contained filamentous mucus. The ileum contained a round worm.

CASE XVII.—*After sudden suppression of perspiration, symptoms of congestion of the cervical region, followed by inflammation and subsequent implication of brain—Death.*<sup>1</sup>

A male, aged forty-three, of strong constitution, after severe exertion during the last days of May, was seized with severe pain in the superior part of the back, and difficulty in moving the head, on the 1st of June, supervening on the sudden suppression of an abundant perspiration from exposure to cold. He continued his

<sup>1</sup> Clot sur le Spinitis, Montpel. 1820.

occupation, that of a concierge, at the prison of Fort St. Jean, Marseilles, up to the 5th. He was brought into the Hotel Dieu at 8 A.M. on the 6th. His pulse was strong and irregular, respiration free, but at times oppressed, particularly when he attempted to swallow fluids. When a bright object was presented to him, a painful sensation was excited, which obliged him to cover his eyes. Deglutition was impossible; for the moment a drop of fluid entered the pharynx, spasm was excited; neither rigidity nor contraction of the limbs existed.

*7th.*—Delirious, face altered, conjunctivæ dirty and injected, expression sometimes stupid, at other times furious, extreme loquacity, general prostration, abdomen distended, insensibility, and stertorous respiration; death.

*Post Mortem.*—In the skull the arachnoid and pia mater were gorged with blood, choroid plexus the same; no serum in the ventricles. The under surface of the cerebellum and the medulla oblongata appeared slightly inflamed.

In the vertebral canal, the cellular tissue covering the dura mater in the cervical region was infiltrated with blood; the cord on its posterior part corresponding to the infiltration was inflamed, and the vessels ramifying on it were highly injected, and the arachnoid contained some red coloured serum.

#### POSITION, DURATION, AND TERMINATION.

Of fourteen cases of acute inflammation of the cord occurring as a primary disease: in four the cord was

generally inflamed, in four it was seated in the cervical portion, in one in the lower part of the cervical and upper part of the dorsal, and in five in the lower half.

Of the four cases in which the cord was generally affected : death ensued in one, a female, aged eighteen, on the seventh day, during an access of suffocation while drinking ; in the second, a male, aged fifteen, on the ninth day, during an access of suffocation—he had suffered from accesses of congestion of the cord for seventeen days ; in the third, a male, aged twenty-two months, on the ninth day, in a state of coma ; and in the fourth, a male, aged twenty-eight, on the fifteenth day, from asphyxia—he had suffered from symptoms referable to the base of the brain, with pain along the spine, for three weeks before the cord became decidedly affected.

Of the four cases in which the disease was seated in the cervical portion : in one, a male, aged forty-three, death ensued on the seventh day, in a state of coma ; in the second, a male, aged twenty-one, on the eighth day, from asphyxia ; in the third, a female, aged twenty-two, on the twenty-seventh day, from asphyxia ; in the fourth, a female, aged seventy-nine, death ensued from asphyxia—the duration of the disease is not stated.

In the case in which the disease was seated in the lower part of the cervical and upper part of the dorsal, the patient, a male, aged sixteen, died on the eighth day, from prostration.

In the five cases in which the lower half of the cord was affected, death ensued from other diseases. In one, a male, aged forty-six, it occurred from abscess of the

kidney ; in a second, a male, aged twenty-seven, from effusion into the pleura ; in a third, a male, aged sixty-five, from bronchitis ; in a fourth, a male, aged twenty-three, from sloughing of the sacrum ; and in a fifth, a male, between twenty-five and thirty, from yellow fever.

From the above results it will be seen that inflammation of the lower half of the cord rarely proves fatal, unless it occurs in connection with some other disease ; and that inflammation of the whole cord, or of the cervical portion, generally ends fatally within ten or fifteen days ; in one instance, however, in which the cervical portion of the cord was affected, death did not take place until the twenty-seventh day.

#### DIAGNOSIS OF ACUTE SPINAL MENINGITIS FROM ACUTE MYELITIS.

##### *I. Of acute inflammation of the arachnoid from acute inflammation of the cord.*

<i>Acute inflammation of the arachnoid.</i>	<i>Acute inflammation of the cord.</i>
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1. Of much more frequent occurrence than acute inflammation of the cord.

1. Rare as a disease, presenting the stage of induration ; but rather frequent as acute softening, particularly as a secondary affection in spinal meningitis.

2. The paralysis of motion commences in the feet, and ascends successively to

2. The paralysis of motion generally affects the whole of the extremity—either at



the legs, thighs, abdomen, chest and arms. From the paralysis depending on the presence of fluid, depressing the head and shoulders, by causing it (if not bound in by adhesions) to gravitate to the upper part of the canal, suffocation may be excited. The paralysed extremities are sometimes affected with tremulous motions, or slight convulsive shocks; but the muscles never become rigid, contracted or convulsed. The cutaneous sensibility is sometimes increased.

3. It is not a fatal disease, unless the membranes of the brain, or the upper part of the cord, or the cord itself, become implicated.

once—or in a short time; sometimes it passes from above downwards; it is accompanied first by rigidity, then by contraction and convulsive shocks, or convulsions which sometimes become general. As the paralysis depends on disease of the cord, altering the position of the body does not induce suffocation. The cutaneous sensibility is generally increased, in some cases more than in others.

3. It invariably proves fatal, when the cervical region becomes affected, in from ten to fifteen days; in only one case out of fourteen, life was prolonged to the twenty-seventh day.

## II. *Of acute inflammation of the pia mater from acute inflammation of the cord.*

It is scarcely possible to determine whether the inflammation is seated in the pia mater or in the cord;

for the symptoms in both depend upon irritation of the nervous substance. Inflammation of the pia mater is more frequently met with than inflammation of the cord with the stage of induration fully marked. In inflammation of the pia mater, the rigidity and contraction are generally more intense and pronounced than in inflammation of the cord; the pain in the spine is also more severe; but there is less paralysis of motion, the patients are often able to walk, particularly at the onset, even when there is marked rigidity of the neck or back; they will however, avoid doing so, from the aggravation of the pain, rigidity and contraction, which ensues when any attempt is made to move the body.

#### TREATMENT.

*In the first, or stage of congestion.*—The copious abstraction of blood, both locally and generally, and the free exhibition of mercury to bring the system as rapidly under its influence as possible, seem to be the most effectual plan of treatment.

*In the second, or stage of induration.*—The same measures should be employed.

*In the third, or stage of softening.*—The strength must be supported by beef tea, wine, and quinine. When the lower half or third of the cord is affected, the patient's life may be, by the use of a water bed, prolonged for months, or even years.

## CHAPTER IV.

INDURATION OF THE CORD—*Chronic Inflammation of the Cord—Chronic Myelitis.*

SYN.—*Paralysis from induration of the cord.*

CHARACTERISTICS.—*Numbness and pain in the nerves of the extremities or muscles supplied with nerves from the point or below where the cord is affected, with paralysis of motion more or less pronounced—Alteration of sensation—rigidity and contraction—Cramps or agitations, with convulsions of the parts affected, sometimes of the whole body, of an epileptic or tetanic character.*

## CAUSES.

I. PREDISPOSING.—*Sex and Age.*—Males seem to be more liable than females to induration of the cord ; for, out of thirty-four cases, twenty-one of the number belonged to this sex. In induration of the cord with induration of the brain the liability, however, seems to be more pronounced on the part of females ; for all the patients, seven in number, were females.

The disease, as will be seen from the following table of forty-one cases of induration of the cord and induration of the cord and brain, seems to be most liable to occur between the second and fifth year, between the thirtieth and thirty-fifth, and between the thirty-fifth and fortieth.

In 1 case the patient was under 1 year					
In 7 cases the patients were between 2 and 5 years					
In 4 ditto	"	"	"	5 and 7	"
In 5 ditto	"	"	"	30 and 35	"
In 9 ditto	"	"	"	35 and 40	"
In 4 ditto	"	"	"	40 and 45	"
In 2 ditto	"	"	"	45 and 50	"
In 3 ditto	"	"	"	50 and 55	"
In 3 ditto	"	"	"	55 and 60	"
In 3 ditto	"	"	"	60 and 70	"
In 2 ditto	"	"	"	70 and 80	"

Before the seventh year the disease seems to occur rather more frequently under the form of induration of the cord and brain, than as induration of the cord ; this was observed in seven out of thirteen cases. Of the six remaining cases in which the cord was affected : in one, observed by Dr. Bright,<sup>1</sup> the annular protuberance and the infundibulum were also indurated ; in four other cases, two of which were observed by Rilliet and Barthez,<sup>2</sup> one by Ballard,<sup>3</sup> and one by Maunthner,<sup>4</sup> the induration, although general, was confined to the cord. In a case recorded by Andral,<sup>5</sup> the induration was confined to the cervical region.

Induration of the cord and the brain seems to be of rare occurrence in adults. Pinel Fils<sup>6</sup> met with it in a female, aged fifty-two, who had sunk into a state of

<sup>1</sup> Bright : Reports of Medical Cases, vol. ii., case xxi.

<sup>2</sup> Maladies des Enfants, tome i.      <sup>3</sup> Maladies des Enfants.

<sup>4</sup> Krankheiten des Gehirns und Rückenmarks.

<sup>5</sup> Anatomie Pathologique.

<sup>6</sup> Recherche d'Anat. Pathol. sur l'Endurcis, du Système Nerveux. Paris, 1822.



idiotism from repeated attacks of paralysis. Larrey<sup>1</sup> found the cord indurated with atrophy of the right lobe of the cerebellum. The patient had received a sabre-cut, which had removed the skull and part of the dura mater, exposing this part of the brain.

II. EXCITING.—1. *Of induration of the cord.*—In the majority of the cases which I have collected and observed, no cause could be or was assigned for the occurrence of the disease. Exposure to wet and cold for some time, residing in damp houses or in marshy districts, and injuries of the spine, seem to act sometimes as excitants of the disease.

2. *Of induration of the cord and brain.*—In three out of seven cases, it was excited by or followed teething; in two of the cases the patients were sisters. In a fourth case it occurred on convulsions which had followed a fall on the head; In a fifth, on repeated attacks of paralysis; in the remaining two cases no cause is assigned—one of the patients had lost two brothers and a sister from hydrocephalus.

#### CHANGES FOUND AFTER DEATH.

When the disease has been severe and of short duration, the fibrous portion of the cord will be somewhat increased in bulk, more or less elastic and resistant, and of a pinkish, greyish, greenish, or brilliant hue; the grey portion will also be increased in bulk, more or less spongy, and of a deeper or paler colour than usual,

<sup>1</sup> Campagne d'Espagne.

sometimes it will contain striæ or masses of inflammatory exudation. The membranes will be more or less congested, and the fluid in the arachnoid cavity increased in quantity.

When the disease has lasted for some time, the cord will be diminished rather than increased in size, the fibrous portion will be generally white or grey—the grey portion of a paler or deeper colour than usual, and either friable or gelatinous; sometimes it is in a fluid state and contained in a canal, the walls of which are formed by the indurated fibrous portion. In some instances the fibrous portion is also found in a state of gelatinous softening.

When the disease has lasted for some years, the cord, particularly when its lower third is affected, is diminished to a third or even a sixth of its usual size, and converted into a cartilaginous or fibrous cord, or an elongated sac, formed by the membranes of the cord, and containing a little colourless or turbid fluid.

The membranes are sometimes unaltered, but sometimes they adhere to each other and to the cord, containing at times opaque patches or cartilaginous deposits. The arachnoid cavity in these cases rarely contains a very large quantity of fluid.

The nerves sometimes participate in the alterations observed in the cord, but sometimes they present distinct alterations. These alterations may either arise from inflammatory action or from disuse. In some instances they are found of the consistence and appearance of cartilage; in others, the whole of their nervous matter has

been absorbed, leaving only their neurilemma, containing a little fluid, or forming fibro-membraneous cords. In some cases the nerves are only reduced in size.

The microscopical changes will vary. In the more active form, the white portion will contain granular corpuscles, granules, oil globules, with altered nerve fibres: the grey portion, granular corpuscles, granules, oil globules, blood corpuscles, hæmatin, broken up nervous matter, and blood-vessels, and sometimes particles of cholesterine.

In the more chronic form: in the white portion the granular corpuscles, granules, and nervous matter will be more or less replaced by fat, and the same will take place in the grey. In a still more advanced form, even the fat globules may have disappeared, leaving only some yellow or clear fluid in which some particles of cholesterine may be sometimes found floating.

Softening frequently occurs on induration, first, as a termination of an inflammatory character, from the breaking up of the granular corpuscles setting free the granules, and destruction of the nervous substance; secondly, as a termination of a non-inflammatory nature, in which the elements of inflammation either retrograde or become, with the nervous substance, altered, and replaced by a kind of soft cartilaginous or gelatinous substance.

#### GENERAL SYMPTOMS OF INDURATION.

*Of induration of the cord.*—As in acute inflammation of the cord, a stage of congestion precedes the induration. Pain is sometimes experienced in the part of the spine where the cord is affected; often, however,

of so slight a nature as to escape the patient's notice. Sometimes a feeling of coldness or heat alone exists.

The extremities or muscles supplied with nerves from the affected part of the cord, or, if the whole circumference of the cord is affected, the body below it, feel benumbed, weak, or constricted. These symptoms are increased by exertion, and, in females, before the menstrual period.

In a case which has fallen under my observation, the patient when quiet experienced but little inconvenience; but immediately on making slight exertion, a feeling of numbness, with weakness and constriction, set in, followed by painful twitching of the flexor muscles of the legs.

The sensation of the parts affected is sometimes natural, sometimes more obtuse or more sensitive than usual. In some cases the skin is affected with tingling or a feeling of increased coldness or heat. In the hands and feet these different states are often met with distinct or intermixed. In the soles of the latter, from the presence of obtuseness or increased sensitiveness, the patients complain either of not feeling the ground at all, or else of feeling it too acutely; sometimes, from these sensations being intermixed, they feel as if walking on an irregular or pointed surface, or, from the increased coldness or heat, that they are walking on ice or hot sand, and when these are intermixed, on an irregularly heated surface.

In the cases in which the hands are affected, the alteration of sensation sometimes shows itself by an inability to distinguish a rough from a smooth surface—a hard from a soft, unless aided by the sight; or altera-



tions in the temperature, so that cold substances or fluids feel hot, or hot cold ; in some instances the patients can only feel substances or fluids when these are either very hot or very cold. These alterations of sensation belong as much to the stage of induration as to that of congestion, often commencing in the latter and becoming fully developed in the former.

Increased venereal desire is generally observed in the stage of congestion, it continues in the stage of induration and often increases until the latter becomes general, or atrophy or softening sets in, then it declines and frequently disappears altogether. It is accompanied at first by an increase in the size of the testicles, but later by a diminution, and in cases of long standing they are often not larger than marbles or kidney beans.

*Stage of induration.*—The intensity of the symptoms present during and on the establishment of this stage will greatly depend on the extent of the disease, its activity, and the amount of irritation which it excites. Thus a slight alteration may excite very severe symptoms, while one very severe may exist, and the symptoms present be but slightly marked. Esquirol<sup>1</sup> mentions the case of a female, for a long time subject to epilepsy, and which, after taking a considerable quantity of mercury for a syphilitic disease, became more frequent and attended by mania, sometimes before, sometimes after the accesses. Death ensued from disease of the uterus and ovaries. The lumbar portion of the

<sup>1</sup> Bullent. de la Facult. de Méd., tome v., obs. 2.



cord was found indurated. Ollivier<sup>1</sup> found the cord generally indurated in a female who had been subject to epilepsy in consequence of fright, for eight years before her death. Andral, in a child who died from epilepsy, found the cervical portion of the cord indurated. Convulsions, it may be observed, frequently exist in disease of the cervical portion of the cord, less so when the dorsal is affected, and still less when the lumbar is the seat of the disease; the above case of Esquirol's being, with the exception of one reported by Hutin,<sup>2</sup> in which convulsions were followed by induration and atrophy of this part of the cord, the only instance with which I am acquainted.

In considering the symptoms present in this stage, it will be better to commence with the *lumbar portion of the cord*, for it is there that they are generally most marked. The pain in the spine, if it has existed in the first stage, becomes more severe, and it often passes along the nerves under the form of shocks, or the nerves become the seat of pains of a dull, gnawing, or tearing character, increased by accesses, during which the extensor muscles often become rigid, or the flexors contracted, sometimes only slightly, sometimes severely; or the limbs are violently agitated, or thrown into convulsions, during which they are alternately extended and retracted. These accesses are of variable duration, lasting in some cases for a few moments, in others for some time, increasing in severity and frequency as the disease

<sup>1</sup> Malad. de la Moel. Epin.

<sup>2</sup> Biblioth. Médicale, 1829, tome i., obs. 2.

advances. They have a great tendency to occur during exertion, in the night, when the limbs hang down for any length of time, or on mental excitement; but sometimes they occur spontaneously, on grasping the limb suddenly, tickling the soles of the feet, or applying a hot plate, or on rubbing the skin over a nerve for a short time. Pain is not always excited by these convulsions; in most cases, however, it is very severe.

In some cases rigidity with extension or contraction of the extremities alone exists; the latter is more frequently observed than the former, in it the legs are flexed on the thighs, the thighs on the pelvis, and the heels rest against the buttocks. The patients possess no power in counteracting either of these states, except when the disease is recent, even then it is generally very limited, and can only be exerted after a certain amount of extension or flexion has been made by another person. It is generally soon lost, either from the gradual re-establishment of the former state of rigidity, and extension or contraction; or suddenly, if the limbs are placed in a position in which the flexors or extensors cease to counteract each other.

The cutaneous sensibility is variously affected: in some cases it remains intact, while in others it is diminished, destroyed, or increased. Complete loss is rarely observed, unless the cord or the nerves of sensation are disorganised; obtuseness, however, is frequently met with, and it sometimes presents some marked peculiarities. Thus in some instances there is a degree of dulness, so that a prick with a pin is not felt for some

moments ; sometimes it is not felt at all, while the contact of the hand or a large body is perceived immediately. Increased cutaneous sensibility may exist permanently, or only for a time. The latter seems to be more frequently observed than the former, and it may occur at the commencement of the disease, when it is extending, or during or after the clonic convulsions. The skin during its existence is generally the seat of pain, irritation, or heat. Paralysis of the bladder or rectum generally exists in a greater or less degree.

Atrophy of the muscles sometimes occurs : in some cases it takes place soon after the disease is developed, and assumes an almost acute character ; in others slowly, and not until the disease has existed some time.

The *dorsal portion of the cord* rarely becomes primarily affected, unless it is in connection with disease of the lumbar or cervical portion. It sometimes becomes secondarily implicated, from the induration extending from the lumbar or cervical portion. The symptoms present when it is affected will vary according to the point where the disease is situated, its extent, and the amount of irritation which it excites ; they will also be influenced by the symptoms present in the parts affected before it became implicated. Thus, when it becomes affected from the disease extending upwards from the lumbar portion, the same symptoms will exist. If the cutaneous sensibility of the lower extremities was increased, the muscles rigid and extended or contracted, a similar state would exist in the abdomen and chest. When the disease is extensive, clonic convulsions of the



trunk generally occur, the lower extremities being similarly affected; and it is not uncommon for the convulsions to become general and assume either a tetanic or an epileptic character.

The functions of the stomach often become disordered, and there is either frequent vomiting of a spasmodic character, or difficult and painful digestion: those of the bowels are also affected; attacks of severe pain or diarrhoea frequently occur, and sometimes ulceration of the mucous membrane of the intestines.

The diaphragm is frequently affected with spasmodic contractions, which render the breathing difficult, from a feeling of constriction or oppression of the lower part of the chest; or render it convulsive, or produce severe hiccough. These attacks are very liable to occur after food or after drinks, particularly when stimulating or taken in large quantities, and sometimes on mental excitement, bodily exertion, rubbing the walls of the abdomen, pressing on the epigastrium, or, if the cutaneous sensibility is much increased, by pricking or pinching the skin of the sides or lower parts of the chest. In some cases the fits of hiccough terminate in vomiting.

When the upper part of the dorsal region is affected—a state which seems rarely to occur without implication of the lower part of the cervical—the arms will present the same symptoms as did the lower extremities in disease of the lumbar portion. In the arms, however, the symptoms are never so strongly marked as in the legs.

When the *cervical portion of the cord* is affected, the symptoms, from the disease being of slight extent and

latent in character, are often obscure. The general symptoms, from the complicated functions of this part of the cord, will vary very much, and it is not always possible to determine, particularly at the commencement of the disease, whether the cord is or is not affected. There is generally pain in some part of this region, increased by moving the neck, and sometimes by pressure. In some cases the nerves of the back and sides of the neck are the seat of neuralgic pains. One or other of the arms, rarely both, at the commencement of the disease, are generally more or less rigid, extended or contracted, and affected with pain or convulsive contractions.

It is not common to find, even towards the close of the disease, that both arms are equally affected. Thus, one may be more or less rigid, and the cutaneous sensation increased; while the other may be more or less motionless, and its cutaneous sensibility obtuse or completely paralysed. As the induration extends, one or both sides of the body, and one or both of the lower extremities, become weak, and sometimes—if the disease is extensive or progressing, and excites much irritation—the seat of severe pain, convulsive contractions and rigidity; there is generally some degree of paralysis of the sphincter ani; sometimes the bladder is also affected, or an increased desire to pass water exists.

The pharynx and œsophagus are sometimes the seat of a feeling of constriction; or difficulty of swallowing exists, sometimes of a spasmodic, at others of a permanent nature; the voice in these cases is sometimes suppressed or altered in tone, or, after a few words have been uttered,



it fails, from the patient being unable to fill the lungs; occasionally words are uttered contrary to the sense the patient wishes to convey. The tongue is sometimes paralysed, completely or incompletely; sometimes, without any defect in its motions, it does not seem capable of readily adapting itself to the size of the mouth or of modulating the voice. The breathing is generally affected, in most cases it is oppressed, and the patients are very liable to spasmodic attacks of difficulty of breathing. These attacks have a great tendency to occur in the night, on exertion, or from mental excitement; and when once they set in, and increase in severity, they hasten, sometimes suddenly, the fatal termination.

The muscles of the neck are often rigid and contracted—generally those of one side only are affected; but when the disease exists in both sides of the cord, all are more or less implicated. The muscles of the face, and in some cases those of the eyes and eyelids, are similarly affected. The sight of one or both eyes is frequently defective.

The functions of the stomach are frequently interfered with; food is often digested with difficulty and much pain; fits of vomiting are very liable to occur, and sometimes the stomach loses its power for a time of digesting the food, which is either rejected several hours after it has been taken, or passed from the bowels in an undigested state. The functions of the lungs also often become embarrassed; the patients frequently suffer from cough of a short and hacking or convulsive character. Congestion of the lungs, tubercular deposits, or

clogging of the bronchia from the accumulation of mucus, are very apt to occur. The patients generally complain of headache ; they are usually very irritable and nervous, and at all times liable to fits of passion. Epilepsy is of frequent occurrence.

*General, or nearly general, induration of the cord,* seems to occur more frequently than the partial form, or it is more liable to terminate fatally ; for it existed in twenty-three out of thirty-eight fatal cases. Its occurrence seems to be due to the disease extending upwards when the lower part, downwards when the cervical, upwards and downwards when the dorsal part of the cord is affected ; but in most cases it seems to be developed in the whole, or nearly the whole, cord at the same time. When the lower part of the cervical or dorsal portion is affected, the disease often follows a peculiar course ; the arm of one side becomes first affected, then the leg of the same side, followed by the opposite leg, and then by the opposite arm.

It is in general, or nearly general, implication of the cord that convulsions are most frequently observed, presenting, in some instances, all the characters of epilepsy ; in others the senses are preserved, the trunk and the upper and lower extremities becoming rigid and violently agitated, or the trunk rigid and straight or curved, and motionless or but slightly agitated, the limbs being thrown into violent extensions and retractions, or rigidly extended or contracted. In some cases convulsive agitations exist. Bergamaschi mentions a case which entered the hospital with these agitations ; they increased

in severity, and at length assumed all the characters of epilepsy.

Fever is rarely present, the skin may be dry and harsh, and its temperature somewhat raised towards night, unless disease of some internal organ occur; the pulse is generally slower than natural: in disease of the cervical portion it often ranges from 35 to 40 or 45.

*Induration of the cord and brain (Cerebro-Myelitis).*

This is also a disease of a chronic character; generally, however, it is much more rapid in its course than when the cord is alone affected; it may, however extend over a period of some years. I have unfortunately lost the notes of a case in which it had existed eight years, the disease having commenced when the patient, a female, was only two years of age. In a case reported by Dr. Bright, the disease had existed for one year and nine months before it proved fatal; and in another reported by him the disease threatened to last some time.

The disease seems generally to commence in the brain, the cord becoming subsequently affected; occasionally in the brain and cord at the same time, or in the cord, extending subsequently to the brain.

In three of the seven cases, the disease was preceded by convulsions,—in one case, it was developed by them; in another, they had occurred several times; in a third, they had occurred once a month for eighteen months; in a fourth case, the patient had had several attacks of paralysis which had at last terminated in idiotism; in the fifth case, the patient had suffered from symptoms of cerebral congestion for several weeks.



CASE XVIII.—*Repeated attacks of convulsions during eighteen months—then cerebro-myelitis—Death.*<sup>1</sup>

A female, aged three years, when seen on the 21st of April had been ill five weeks. Eighteen months ago she fell on the back of her head: no complaint was made at the time, but at the end of a month convulsions set in, and lasted two days and a night. Since this time she has been subject to monthly attacks, the convulsions lasting, however, for only a quarter of an hour. Five weeks ago she became insensible, and for the first three screamed incessantly; since then she has lain in the state she now presents, appearing in a perfectly tranquil condition, the eyes wide open, the breathing extremely slow and quiet. She has not spoken or noticed anything since she was first seized. She does not appear either to hear or see. From time to time her eyes wander over objects, but without appearing to recognize or dwell on them for an instant; the pupils are natural, perhaps rather smaller than in health, uninfluenced by the light of a candle—the light of the sun, the mother states, “does not cause her to blink.” The left arm and leg are in a state of constant retraction and extension, not, however, very strongly marked; but the right arm and leg (with the exception of the fore-arm and hand, which are incessantly rotated and pronated) are motionless. The pulse of the right wrist is quick and small, but that of the left is nearly imperceptible; skin harsh, pallid, and cool,

<sup>1</sup> I have to thank Mr. Lillie, of the Kingsland-road, for bringing this case under my notice.



sometimes becoming, however, hot towards night for two or three hours; it is insensible to pricking and pinching. Tickling the sole of the left foot slightly increases the movements of retraction and extension of this leg. The bowels are very confined, the motions dark green; the bladder is distended, and the urine dribbles away—it smells very ammoniacal. She has emaciated very much, but her appetite continues good; thirst slight. Her head is not enlarged, nor is its temperature increased; the occiput is drawn back, from contraction of the muscles of the back of the neck; it can easily be drawn forward, but the moment the hand is removed it returns to its former state. From contraction of the muscles of the spine the trunk was curved slightly. The convulsions still continue to occur at irregular periods; last night they were very severe. They are preceded by blackness around the mouth and under the eyes, and flushing of the face; in the convulsions the body is rigid, head drawn back, eyes fixed, mouth drawn down, legs retracted, and the arms fixed to the sides. She seems to doze at times, but never falls asleep, nor did she do so throughout the disease.

*April 24th.*—The convulsions had been rather more severe and more frequent; the movements of the right hand were more severe, and the fore-arm now participated in them; both legs were constantly, though not violently, extended and retracted; the lips incessantly brought together and separated. All these movements were perfectly rhythmical.

*May 2nd.*—Same state. The skin is hot—it has

been so since yesterday ; the pulse is now equal on both sides—90, but feeble ; the convulsions have been unusually severe to-day.

8th.—On the 3rd, she became cold and pale, and death was expected every moment ; the same state occurred frequently during the course of the disease. The convulsions continue to recur quite as often, but not so violently ; pulse 76, very feeble ; the emaciation has greatly increased ; appetite extremely ravenous. One day the mother observed that she could not bear the light of the sun. The cutaneous sensibility has for some days been slightly increased ; it is less marked to-day than it was, and the pupils are the same as on the first visit ; the eyes seem to dwell for several seconds on an object, slowly passing on to another, and resting much longer on some than others.

17th.—Same state ; the emaciation has greatly increased. On the 12th, vomiting set in, and everything but a little thin arrow-root, a tea-spoonful at a time, was rejected. The convulsions have ceased for some days.

30th.—Four days ago the convulsions returned, and for twenty-four hours were very severe. Emaciation greatly increased ; stomach very irritable. Both the upper and lower extremities are in a state of great agitation ; this has existed since the convulsions were so severe. Extremities very cold, and they are with difficulty kept warm ; pulse very feeble. The teeth are covered with dark fur — the tongue the same ; the lower jaw has been in constant motion since the fits

returned, the teeth grinding against each other, the movement being invariably from left to right, and rhythmical—it continued up to the time of death. The back of the head feels very hot.

*June 20th.* — The convulsions have increased in severity ; they generally occur in the night twice or three times a week. During the last fourteen days she has uttered plaintive cries from time to time ; the head is in constant rhythmical motion, rolling slightly from right to left : for two or three minutes before the fits it is at rest. The appetite is very ravenous ; emaciation extreme ; vomiting frequent. For some days before death, which took place on the 4th of July, after a night in which the fits had been unusually severe, green diarrhoea existed.

*Post mortem thirty hours after death.*—The body was in a state of extreme emaciation and of the colour of white wax. The dura mater on the left side adhered closely to the skull, and when opened six ounces of clear serum escaped. The left lateral sinus contained a dark clot of coagulated blood about one inch long ; this was the only blood contained in the skull. The arachnoid was slightly opaque and adherent to the pia mater for the space of the size of a five-shilling piece on each side of the posterior part of the longitudinal fissure. The anterior lobes were slightly adherent. The cortical substance was of the same consistence as usual ; but the white was generally hardened ; the hardening seemed more pronounced in the right than in the left lobe. It was of the colour of washed fibrine, extremely elastic, and could



not be crushed between the finger and thumb. The brain was not enlarged; on the contrary, it was smaller than usual. The lateral ventricles were empty. The cerebellum was rather darker and softer than in health; the white and grey portions were equally affected. The cord was diminished in size throughout and indurated; the change was confined to the white portion, which was extremely dense and brilliant; the grey was of its natural consistence, but smaller in quantity, and rather pale. The spinal canal contained a small quantity of fluid. The optic nerves seemed rather smaller than usual, but their consistence was natural; the other nerves were in a similar state. The stomach was generally softened; the mucous membrane of the small intestines ulcerated; the bladder was distended with ammoniacal urine, its lining membrane inflamed; the spleen and lungs contained some tubercles, and the bronchi were distended with mucus.

CASE XIX.—*Congestion of the brain, followed by cerebro-myelitis—Death.*

A female, aged three years, one of seven children, three of whom had died from hydrocephalus, complained, in the month of March, 1855, of pain in the head. Her appetite continued pretty good, as did her general health, but she was captious; her mind seemed less active than usual, and she preferred her mother's lap at the fire-side, and resting her head, to playing with the other children. It was thought, as several worms had been passed, that she was suffering from them; worm powders were there-



fore given, and with the effect of causing the expulsion of two or three, and relieving the symptoms ; still she did not recover her former health.

On the 30th of April she came under my notice ; she had been worse about a week, face pale, and with an expression of anguish ; pulse small, and rather quick ; skin harsh and dry, but its temperature was not increased ; tongue rather moist, and deepened in hue ; bowels confined ; respiration rather slow—a deep sighing one being made every two or three minutes. She complained of her head, where one or both hands were being constantly raised ; its temperature was not increased. From time to time she uttered plaintive cries, particularly during the night, at which time the skin was rather hot, and she was very restless : moving or touching her also excited these cries. During the last three days her eyes have been several times observed to be fixed for several minutes, the pupils being turned up under the lids. The latter were half-closed from a state of contraction of the orbicular muscles, and quite rigid. The child had emaciated considerably during the last week, and her appetite had failed. By the use of warm baths, cold to the head, and leeches, with calomel and antimony, she no longer complained of the head, and the fixing of the eyes ceased ; yet she made no progress towards a state of health, and the emaciation increased.

On the 25th of May she was seized with convulsions, both arms and legs were rigid, and she uttered loud screams. In twenty-four hours four attacks occurred, varying in duration from half an hour to an hour and a

quarter. The former symptoms returned with increased severity; the contraction of the left orbicular muscle became more marked than that of the right, and the corresponding eye became permanently fixed; the pupils were natural; deglutition was rather difficult, and there was slight cough, with mucous râle. The cutaneous sensibility seemed rather increased. Both arms and legs were rigid, but it was only observed when any attempt was made to move them: it was not so strongly marked that it could not be easily overcome. No attempt was made to exert the power of the will.

The symptoms from this time up to the 14th of June, when death ensued, gradually increased in severity; the rigidity, particularly of the lower extremities, became more confirmed; deglutition more difficult, particularly of fluids. She ceased to speak, but uttered low plaintive cries almost incessantly; the pupils were largely dilated; vision had evidently failed, and both the urine and fæces were passed unconsciously. Two days before death the power of swallowing completely failed; any attempt to introduce fluids into the stomach threatened to induce suffocation; the fingers of the right hand grasped the throat rigidly, and the breathing was greatly embarrassed from the accumulation of mucus in the bronchial tubes. Death ensued.

*Post mortem.*—The sinus of the dura mater were gorged with dark blood, the vessels of the membranes were the same; the brain was increased in size, the cortical portion of a deeper hue than usual, and rather soft; the medullary part was generally increased in

density, its colour approaching to grey; the lateral ventricles contained about three ounces of fluid, and the medullary substance immediately surrounding them was much denser than the rest of the brain. The cerebellum was injected, the white portion denser than usual, but the density was not so strongly marked as in the cerebrum. The optic nerves were increased in consistence, as were the third, fourth, fifth, and sixth nerves. The spinal arachnoid contained a little serum; the cord itself was increased in magnitude, the white portion being of the colour of the medullary portion of the brain, the grey deepened in hue and spongy.

CASE XX.—*Convulsions, followed by cerebro-myelitis*  
—*Death.*<sup>1</sup>

A female, aged three years, entered the hospital on the 24th of August, 1829. About fourteen days ago she was taken ill with strong convulsions; she has since been blind, and also affected with severe diarrhœa. She is somewhat emaciated, head large, eyes without expression, very moveable, pupils contracted and directed upwards when the lids were opened; they dilated well when the lids were depressed. The left eye is affected with convergent strabismus. There is slight fever, the edges of the tongue are red, but its centre is white; frequent diarrhœa; abdomen distended; respiration very calm; slight cough. Both the fæces and urine escaped involuntarily. She is quite tranquil and silent, but when spoken to or touched, cries; then the face is turned a little to

<sup>1</sup> Burnet: Jour. Hebdom., tome v. 1829.



the right. Generally she lies on her back ; sometimes, however, she sits up. All her senses save the sight are intact ; the extremities moveable, and appetite good. A seton had at the first been established in the neck, and an ulcer by means of caustic potash was produced behind one ear, and, a little later, behind the other.

The only change observed up to the 28th of September, was, that she got more emaciated, and that slight ophthalmia manifested itself in both eyes about the middle of the month. On this day somnolency and slight resolution of the extremities set in. The pulse was moderately quick, the eyelids rather swollen, the conjunctivæ red, and a great quantity of sero-purulent fluid escaped from them ; the pupils were moderately contracted and motionless, the eyes haggard, drawn up, and more fixed than usual. This state continued up to the 28th of October, when the feebleness became rather less. Since the 28th of September she has cried less when touched or spoken to.

*November 5th.*—The somnolency has returned with more intensity ; pulse less frequent and smaller ; skin cold, tongue dry and black ; breath fetid, and the abdomen more distended. The respiration is quickened, and there is dulness with bronchial respiration and crepitation at the base of both lungs. The prostration is considerable ; the limbs are not deprived of their power of motion, and sensation is preserved.

*6th.*—The pulse and the cries are nearly imperceptible ; pupils very contracted, particularly the right one, which is motionless. Death took place in the evening without convulsions.



Up to the close of life she could move her limbs. The treatment since the 28th of September had consisted of frictions to the neck, with calomel ointment and acetic ether to the limbs: the diet of rice water and milk.

*Post mortem.*—The body was much emaciated; the head large. The brain filled the whole cavity of the skull; the pia mater was a little injected—it contained a large quantity of transparent serum; at the base of the brain there were five or six spoonfuls, but there was very little in the ventricles.

The brain weighed twice as much as usual; its consistence was greatly increased; it resisted the edge of the knife, and the section was clean, pale and polished. This increased consistence was particularly marked in the superior convolutions, the optic beds, the mesocephale, and the horns of Ammon—in the last even more than in the others, so that they could not be crushed by pressure with the finger and thumb. The grey substance was a little deepened in colour; it was very thin on the convolutions; in the corpora striata its colour was also deepened—it was very dense.

The cerebellum was not so hard as the cerebrum; it was uninjected. The membranes of the cord were pale, the cord itself white, very hard, and resistant in its whole length.

The optic commissure was hardened, the optic nerves small, the membranes formed their chief part; internally on section they resembled cartilage. The retina adhered but slightly to the other membranes of the eye;

its colour was uniformly of a rose red ; the choroid was of the same hue, but it was less marked.

The lower lobes of both lungs were hepatized. The pyloric half of the stomach was of a uniform red ; the duodenum the same, but it was not so intense. The small intestines contained four lumbar worms ; the cæcum also contained a small one. The mucous membrane of the first portion of the colon was of a uniform red ; the rectum presented a number of red bands—it was slightly thickened. The bladder contained some troubled ammoniacal urine ; its mucous membrane was reddened.

CASE XXI.—*Convulsions, followed by cerebro-myelitis.*  
—*Death.*<sup>1</sup>

A female, aged three years and nine months at the time of death. Her health had been good, save while cutting the first teeth at ten months, up to nearly two years, when she had several convulsive fits, which were attributed to the irritation of teething ; but they continued after the process had been completed. Her manner and appearance altered ; she was restless at night, and fretful in the day ; her limbs became gradually stiff and extended with a spasmodic force, and her mind daily became more imbecile. For a year before her death she was quite stiff, and incapable of the slightest effort ; the thumbs were drawn in towards the palms ; these were stretched to their utmost, and drawn in towards each other. There was constant difficulty in swallowing ; bowels confined, and the urine escaped involuntarily.

<sup>1</sup> Bright : vol. ii., case xix. Patient of Dr. Addison's.

After three less restless nights than she had passed for several months, she became convulsed, and then quietly sank.

*Post mortem.*—The emaciation was extreme. While opening the skull, five ounces of serum escaped.

The arachnoid was not thickened, fluid still existed under it; the pia mater was moderately vascular. The brain was contracted, the cortical portion was thick and pulpy, the medullary hard and contracted. The hardness of the latter was suddenly increased towards the surface, forming a kind of margin round the whole, more white and prominent than the rest. By pouring water and a little rubbing, the whole cortical part was removed. Some parts of the brain were rather harder than others. The ventricles were moderately distended with fluid, and their lining membrane thickened. The cerebellum was pallid, its cortical substance soft, and, when cut into, the corpus rhomboideum with the surrounding medullary substance was softened, but round the outside it was nearly as hard as the cerebrum. The nerves of the base of the brain were harder than usual, particularly the optic, which last were elastic, cutting like soft cartilage. The olfactory nerves were soft and flabby. The medulla oblongata and the part of the cord removed with the brain partook, though less markedly, of the general hardness. A few miliary tubercles existed in the lungs.

The sister of the last case,<sup>1</sup> two years and a quarter old, was seen January 27, 1829.

<sup>1</sup> Case XX.



Until three months ago she was in good health and stout—backward, however, scarcely able to walk, and unable to speak. Her head is of a rather peculiar form, being large at the occiput; the feet, as was the case with her sister, are small for her age, and appear to diminish rather than increase. She has cut all the front teeth, and part of the double; she is now cutting some of the others.

For the last month, the child has been falling off, from its appetite and usual ways, seeking its mother's lap, fretful, with restless nights, and gone very much back in walking. A fortnight back her mother observed the child's eyes suddenly acquire a glassy look, but she was not aware that she had had a decided fit. The disease from this time has been very decidedly shown.

At present her features are contracted, lips dry; she is unable to stand, sits or lies in her mother's lap, with the head drawn very much back, so that the occiput rests between the shoulders; constantly moaning and complaining, occasionally stretching out her legs with a kind of spasmodic action; hands closed, although they yield on being opened, yet they are obviously under the influence of spasmodic action. The pupils act, and the eyes follow a moving object, plainly showing that she can see. It is stated that on one occasion vision seemed lost.

She often refuses food, and generally takes but very little; pulse 120; bowels regular, now relaxed from medicine. Leeches have been applied to the temples, and cold lotion to the head.

Seen again in June. She now lies constantly in her



mother's lap, and gets fretful and passionate if not carried about ; head hangs heavily, and there is scarcely any power in the neck ; hands and feet are sometimes stretched out forcibly, and occasionally she is thrown into a straight line. To-day she is unusually free from spasms ; still the right foot is stiff and the left hand contracted. She generally awakes about 5 A.M., and is then very passionate, appearing to be thrown into spasmodic fits. She takes some notice ; deglutition is very difficult, and it is necessary to introduce the food far back into the fauces. She does not seem deaf, but cannot utter a word, lift anything to her mouth, or put a foot to the ground ; bowels confined without medicine ; urine passed in bed, it smells fetid and strong ; she screams occasionally, but to-day she utters plaintive cries ; face fuller than when last seen. Three more teeth remain to be cut, but they do not seem to be coming forward.

*October 9th.*—She has cut all her teeth ; her general condition has altered but very little, though, on the whole, the disease has increased. Her face is vacant ; she appears to see, and certainly to hear ; head generally thrown back ; her legs often forcibly extended and rigid, becoming in a few moments flaccid and admitting of flexion ; hands and arms contracted, and the eyes fixed from time to time.

#### TERMINATIONS AND DURATIONS.

*1st. Induration of the cord.*—Induration of the lumbar portion rarely proves fatal. I am acquainted with three patients who have severally laboured under

it for twenty, thirty-five, and thirty-eight years. When disease of this portion of the cord proves fatal, death generally ensues from diarrhœa, disease of the bladder, uterus, or ovaries, or sloughing of the sacrum.

Induration of the dorsal portion, particularly of the lower half, rarely proves fatal. When death ensues, it generally occurs from disease of the kidneys, bladder, intestines, or sloughing of the sacrum.

When the upper part of this portion of the cord is affected, death sometimes ensues from disease of the stomach or lungs; but more frequently from the lower part of the cervical portion becoming affected, from asphyxia.

Induration of the cervical portion generally proves fatal, by inducing asphyxia; this was the cause of death in five out of eight cases in which the disease was confined to this portion of the cord, and in two in which it and the upper part of the dorsal were affected. In most of the cases the asphyxia was slowly established, either from the gradual extension of the induration upwards, or from the occurrence of softening; in two cases, however, it set in rapidly from the supervention of acute inflammation.

Of the three remaining cases, in one death ensued from bronchitis, and in the two others from cerebral disease.

The duration of the disease will be greatly influenced by its activity and position. When it is seated in the upper part or centre of this region and of an active character, death may ensue in the course of a few weeks; but when it is situated in the lower part, not for some

months or even years, if nothing occur to cause it to extend and interfere extensively with the function of respiration, or unless disease of the lungs, stomach, or sloughing of the sacrum ensue.

In general or nearly general induration of the cord, the same causes may hasten the fatal termination, as when the lumbar, dorsal, or cervical portions are affected.

In children this form of induration seems to prove fatal much earlier than in adults, for of four cases which occurred to children, death ensued in one at the end of three weeks; in the second and third, in from twelve to fourteen weeks; and in the fourth, at the end of sixteen weeks.

The duration of the disease in fifteen adults varied from eighteen months to thirty years; it was greatly influenced by the period in which the upper half of the cervical region became implicated in the induration, or affected with softening. If either of these occurred early in the disease, and were extensive and progressing, death generally ensued in a short time; in some instances, from the sudden extension of the induration, from the disease becoming acute, from the induration breaking up or becoming affected with acute inflammation, or from the sudden occurrence of acute softening, it ensued in a few hours or days.

Out of twenty-five cases which proved fatal, in eight death ensued from asphyxia; in three, from convulsions; in five, from disease of the brain or its membranes; in three, from pneumonia, bronchitis, or pleuritis; in five, from diarrhœa, in two of which cases it was accompanied



by sloughing of the sacrum ; in one, death ensued from scarlet fever ; in one, the patient destroyed himself.

*2nd. In induration of the cord and brain.*—Death may ensue from asphyxia,—this was the cause of death in three of the six cases which terminated fatally ; during or after convulsions,—this was the cause of death in two cases ; or from coma,—this was the cause of death in the remaining case.

The duration of the disease varied ; in one case in which convulsions had existed for eighteen months before the disease became fully developed, it lasted for about eighteen weeks ; in a second and third, about fourteen weeks ; in a fourth, the patient's health had been good, save while cutting the first teeth at ten months, up to nearly two years, when she had several convulsions—they continued, and at length her limbs became stiff, and her mind imbecile—death ensued when she was three years and nine months old ; in a fifth case, the patient had experienced during two years several attacks of paralysis, under which she at length sank into a state of idiotism—she lived rather more than a year after she was admitted into La Salpêtrière ; in a sixth, the disease lasted for eight years ; the patient had sunk into a state of idiotism ; she could only utter some imperfect guttural sounds ; it was necessary to convey the food to the back of the mouth ; the body and limbs were but imperfectly developed, the former being rigid, the latter very much distorted—death ensued from coma ; in a seventh case, the child was alive ten months after the commencement of the disease.



DIAGNOSIS OF INDURATION OF THE CORD FROM CHRONIC  
INFLAMMATION OF THE ARACHNOID AND DURA MATER  
OR PIA MATER, OR OF THE BRACHIAL OR SACRAL  
PLEXUS.

*Induration of the cord.*

*Chronic inflammation of  
the arachnoid or dura  
mater.*

1. Numbness and pain following the course of the nerves; weakness of the extremities passing into paralysis; sensation intact, obtuse or increased.

2. Rigidity, with extension or contraction. Shocks of pain, severe cramps, agitations, or convulsions, during which the affected extremities are thrown into a state of retraction and extension; general convulsions frequently occur.

1. Numbness and pain exist, but they are rarely severe or general. A feeling of weakness and paralysis are generally present, but they depend rather upon a feeling of constriction, unless the cord be congested or the nerves deeply imbedded in hardened inflammatory exudation, than upon want of power. Sensation is rarely affected.

2. Rigidity, with extension or contraction, never occurs; shocks of pain or cramps sometimes exist, but the extremities are never agitated or convulsed, neither are general convulsions liable to occur.

*2nd. Induration of the cord from chronic inflammation of the pia mater.*—Chronic inflammation of the pia mater will produce all the symptoms of induration of the cord. It rarely occurs, but when it does it soon induces softening of the cord.

*3rd. Induration of the cord from disease of the brachial or sacral plexus or the cauda equina.*—Disease of the nervous cords which form the brachial or sacral plexus or the cauda equina may produce symptoms closely resembling those present in induration of the cord.

Disease of the brachial plexus does not seem, however, to be of frequent occurrence; when it does occur, it is generally in connection with chronic inflammation of the membranes of the lower part of the cervical and upper part of the dorsal, or caries of the lateral portions of the vertebræ of these regions of the spine. The symptoms are invariably confined to one arm, and to the muscles which receive their nerves from the brachial plexus. The lower extremities, lower part of the body, bladder and rectum, being unaffected with either weakness or numbness, unless congestion of the cord exists. The latter is, however, very liable to occur in the course of the disease, and produce softening.

Disease of the cauda equina or the sacral plexus is rarely observed, except in connection with caries of the sacral vertebræ.

#### TREATMENT.

The treatment of induration of the cord is rarely followed by any beneficial results, particularly when it

is extensive or of a sub-acute character. The system may be sometimes brought slightly under the influence of mercury, particularly if the disease is recent and not extensive, and if nothing exists to contra-indicate its use, with benefit; but its effect must be kept up for some weeks, to endeavour to cause the absorption of the inflammatory products; blood may be also taken from the spine by leeches or cupping, and often with marked benefit. In some cases the patients experience considerable relief from blisters, setons, or caustic issues kept open for some time; but in others their use is followed by considerable aggravation of the pain, cramps, or contractions.

Strict rest should be enjoined, particularly if exertion is followed by any aggravation or increase in the severity of the symptoms.

A cure can be scarcely hoped for in this disease; but by care and attention life may be prolonged for years in comparative comfort; the patients may even die of old age or some other disease.

The distressing vomiting, and the severe pains, cramps, contractions, and convulsions, may be often mitigated or removed for a time by large doses of sedative solution of opium, tincture of aconite, hydrocyanic acid, and chloric ether, or by chloroform or amilene inhalations. The amilene seems to be preferable to chloroform, as it is less liable to excite unpleasant symptoms; but neither should be used when cerebral symptoms or disease of the cervical portion of the cord exist.

## CHAPTER V.

**SOFTENING OF THE CORD.**—*Chronic Inflammation of the Cord—Chronic Myelitis.*

**SYN.**—*Paralysis from chronic softening of the cord.*

**CHARACTERISTICS.**—*Paralysis of motion and sensation, sometimes only of motion or sensation—When the lumbar or dorsal portion of the cord are affected, the body below the point where the softening exists, the legs, the bladder and rectum, are affected.—When the cervical portion is affected, the body below is more or less paralysed, and the breathing, voice, speech, or deglutition more or less embarrassed.*

**CAUSES.**

**I. PREDISPOSING.**—*Age and Sex.*—Males in this, as in other diseases of the cord and its membranes, seem decidedly more predisposed than females; for out of sixty-two cases which I have collected and observed, forty-four were males, and eighteen females.

It may occur at any period of life; but it is most frequently met with, as will be seen from the following table, from the fifteenth to the twentieth year, from the thirtieth to the forty-fifth year, and after the forty-fifth year; for out of sixty-two cases, eight occurred during the first-named period, twenty-five during the second (this is the period of life in which the predisposition is most pronounced), and eighteen during the third.



	Males.	Females.	Total.
From 5 to 10 years	2	—	2
" 10 to 15 "	—	2	2
" 15 to 20 "	4	4	8
" 20 to 25 "	3	1	4
" 25 to 30 "	2	1	3
" 30 to 35 "	5	3	8
" 35 to 40 "	7	2	9
" 40 to 45 "	6	2	8
" 45 to 50 "	2	—	2
" 50 to 60 "	6	3	9
" 60 to 70 "	5	—	5
" 70 to 80 "	2	—	2
Total.....	44	18	62

II. EXCITING.—Softening may occur from injuries of the spine, caries, softening, exostosis or cancer of the vertebræ, disease of the ligaments of the spinal column, tumours in or induration of the cellular tissue external to the dura mater; acute or chronic inflammation, or bony or cartilaginous deposits in the dura mater or arachnoid; acute or chronic inflammation of the pia mater; congestion or concussion, or acute or chronic inflammation, or tumours, or effusion of blood into the substance, or on the surface, of the cord; epilepsy or chorea; disease of the kidneys; exposure to cold or wet; severe fatigue, particularly when convalescent from disease. It may also occur during convalescence from fever, or from gout or rheumatism.

Caries of the vertebræ seems to be one of the most frequent exciting causes of softening of the cord. It excited the disease in eight out of nineteen cases which

have fallen under my own observation. In several cases, both in those which I have observed and collected, the patients had either had disease of the vertebræ from which they had recovered, leaving a state of curvature of the spine, or they had suffered for years, sometimes only for a short time, from distortion of the spine. In a case observed by Rokitsansky, the patient, a female, had fractured the dorsal vertebræ eighteen years before.

Injury of the spine seems to act frequently as an exciting cause. It was the cause of the disease in two out of the eleven cases of idiopathic softening which have fallen under my own notice, and in five which I have collected from other writers. In one case the patient, a male, aged forty-three,<sup>1</sup> had been knocked down, three months before the symptoms commenced, by a cart; his back received some slight injury, but the disease did not develop itself for several months. In a second case, a male, aged thirty-five,<sup>2</sup> it arose from slipping down in frosty weather: the symptoms did not appear for some time. In a fourth case,<sup>3</sup> after a fall; but the disease did not commence until after exposure to cold. In a fifth case, a female, aged sixteen,<sup>4</sup> from a blow on the back of the neck from the handle of a mangle, the disease did not commence until several months had elapsed. In a sixth case, a male, aged eighteen,<sup>5</sup> of a scrofulous habit of body, from striking the back of the head against a chimney-piece; two months afterwards

<sup>1</sup> Myself.

<sup>2</sup> Ibid.

<sup>3</sup> Astley Cooper, in Stafford's Diseases of the Spine, 1832.

<sup>4</sup> Stafford.

<sup>5</sup> Velpeau: Arch. Gén. de Méd., 1825.

an abscess formed, followed by caries of the second cervical vertebra. In a seventh case, a male, aged fifty,<sup>1</sup> from falling forward on his hands on the deck of a vessel. In an eighth case,<sup>2</sup> from straining the back on lifting a heavy weight.

In two cases the disease was excited by exostosis: in one, of the odontoid process<sup>3</sup> of the second cervical vertebra; and in the second, of the body of the first lumbar vertebra.<sup>4</sup>

In two cases the disease was excited by cancer of the vertebræ. In one case, a male, aged twenty-one,<sup>5</sup> suffering from cancer of the dorsal vertebræ and the dura mater; in the other case the patient was labouring under cancer of the œsophagus,<sup>6</sup> when the dorsal vertebræ became implicated.

In two cases the disease was excited by concussion of the spinal cord. In one case, a male, aged forty;<sup>7</sup> it did not occur until six months afterwards, and in consequence of exposure to cold and over-exertion. In the second case, a female, aged fifty,<sup>8</sup> it set in gradually between two or three months after the effects of the concussion had subsided.

In four cases the disease was excited by exposure to wet or cold. In one case, a male, aged thirty-six,<sup>9</sup> it set

<sup>1</sup> Seaton: London Medical Journal, 1850.

<sup>2</sup> Copeland: Diseases of the Spine, 1817.

<sup>3</sup> Reid: Edinburgh Monthly Journal, 1843.

<sup>4</sup> Myself. <sup>5</sup> Serres: Majendie's Jour. de Physiologie.

<sup>6</sup> Myself. <sup>7</sup> Ibid. <sup>8</sup> Ibid.

<sup>9</sup> Hutton: Dublin Med. Journal, 1847.

in from exposure to wet and cold for some days ; in a second,<sup>1</sup> from exposure to cold while travelling on a coach in the month of March ; in a third, a delicate male, aged twenty-seven,<sup>2</sup> from exposure to cold, want, and great fatigue ; in a fourth, a male, aged thirty-four,<sup>3</sup> from exposure to cold and wet when convalescent from fever. Exposure to cold or wet is very apt to aggravate the disease, and, when it is seated on the upper part of the cord, often hastens the fatal termination.

In three cases the disease was excited by fatigue. In one case, a male, aged fifty-four,<sup>4</sup> by a long walk ; in a second, a delicate male, aged twenty-seven,<sup>5</sup> by walking from Düsseldorf to Cologne, a distance of eighteen miles ; in a third, a female aged forty-two,<sup>6</sup> from sitting up for several weeks, and lifting a heavy person in and out of bed. Fatigue, like exposure to cold or wet, is very apt to aggravate the disease.

In two instances—one, a female aged fifteen,<sup>7</sup> the other a male aged fifty-two<sup>8</sup> — the disease occurred on idiotism which had supervened on epilepsy.

In two cases ; one a male aged forty-four,<sup>9</sup> addicted to drinking—the disease set in during convalescence from fever : and in a second, a soldier,<sup>10</sup> when convalescent from petechial fever.

<sup>1</sup> Abercrombie.

<sup>2</sup> Myself.

<sup>3</sup> Ibid.

<sup>4</sup> Grisolle : Jour. Hebdom. 1836, tome i.

<sup>5</sup> Myself.

<sup>6</sup> Ibid.

<sup>7</sup> Pinel fils : Jour. Gén. de Méd., tome lxxiv.

<sup>8</sup> Calmeil sur la Paralyisie. Paris, 1826.

<sup>9</sup> Dupuy : Jour. Complément, tome xl.

<sup>10</sup> Brera : Ceni. Pathol. Cliniche sulla Rachialgite. Mem. Medico-Cliniche, Osserv. i.



In a great number of the cases which I have collected and observed no cause was assigned for the disease. In some instances the patients considered it had been excited by long continued mental anxiety, in others, by chronic rheumatism or lumbago; strains of or blows on the back, often received months before the symptoms appeared. Dr. Graves<sup>1</sup> considers that "gouty congestion or inflammation, frequently recurring and acquiring increased strength, may in the course of years, or even months, produce softening."

#### CHANGES FOUND AFTER DEATH.

The changes found are essentially the same, with but slight exceptions, as those observed in acute softening; and as in it, they are preceded by a stage of congestion and induration.

The symptoms which indicate the existence of the latter, however, unless it is extensive, are but rarely excited; the symptoms of congestion and softening being generally alone observed.

The softening is commonly either of a red or yellow hue, its consistence varying from that of cream cheese to thin pap. Under the microscope, granular corpuscles, granules, oil globules, sometimes particles of cholesterine, blood corpuscles (in the red), hæmatin (in the yellow), and broken up nervous, and altered from fatty degeneration or inflammation, vascular structures are found. In some cases all traces of these structures will

<sup>1</sup> Clinical Medicine.

have disappeared, leaving only some delicate cellular tissue, containing a little serous fluid ; in others only a membranous sac exists, containing some citron-coloured or opaque serum, in which the débris of nervous and vascular substances, with some particles of cholesterine, are sometimes found. The walls of the sac are sometimes formed by the pia mater, more or less thickened and opaque ; sometimes by the pia mater, arachnoid and dura mater, more or less adherent to each other, opaque, thickened, and containing cartilaginous or bony deposits.

The softening generally affects both the white and grey portions ; sometimes however, though rarely, the white or the grey is alone affected. When the former is affected, the softening may give rise to ulceration. Sir Astley Cooper<sup>1</sup> met with an instance in a gentleman who, after a fall, followed by exposure to cold, became paralytic ; and Chambon de Montaux<sup>2</sup> also observed it in a young female. When the grey portion is affected, canals are sometimes produced, (the walls of which are formed by the white substance), containing the grey portion reduced to a red or greyish pulp, or containing delicate cellular tissue, enclosing a little serum, or containing serum alone ; in some instances the canals are quite empty.

In most cases the vessels of the cellular tissue between the dura mater and the vertebræ are congested, and sometimes those of the membranes of the cord. The membranes are at times opaque and more or less

<sup>1</sup> Stafford.

<sup>2</sup> Voightel Handbüch der Pathologisch Anatomie, band i.

adherent ; sometimes they contain cartilaginous or bony deposits ; the arachnoid canal often contains a considerable quantity of serum.

The nerves, when the softening has been of some duration, are generally atrophied, sometimes they are of a cartilaginous consistence, or reduced to their neurilemma, which in some cases contains only a little serum.

#### GENERAL SYMPTOMS OF CHRONIC SOFTENING.

Chronic softening may occur under three circumstances—1st, as a termination of induration ; 2nd, as a result of congestion, by which fatty degeneration or alteration in the walls of the vessels is induced ; and, 3rd, as a result of acute inflammation (acute softening) : its chronic character in the last case depending rather on its duration than on the slowness of its formation.

Again, chronic softening is often aggravated by accesses of the acute form, or the latter may occur in another part of the cord, particularly in the cervical, while the dorsal or lumbar portions are affected with the chronic form.

*1st, or stage of congestion.*—The softening is generally preceded by congestion, which may be either active or passive, confined to a small space or occupying a considerable portion of the cord.

There is generally uneasiness or pain in some part of the spine, with a feeling of weakness increased by exertion ; and sometimes there is pain or numbness in the parts supplied with nerves from the point where the congestion exists. Sometimes when the congestion is



extensive and of an active character, the extremities are thrown into convulsions.

The sensation of the parts in some cases remains unaffected ; in most, however, it is more or less obtuse, but occasionally somewhat increased. In some instances, these different alterations, when the lower extremities are affected, are intermixed in the soles of the feet, and the patients say they seem to be walking on an irregularly heated or pointed surface ; but generally they complain either of not feeling the ground at all, or of feeling it too acutely. These alterations of sensation sometimes affect only a part of the sole of the foot, the other part being but little or not at all affected.

When the upper extremities are implicated, the patients sometimes complain that they cannot feel minute objects, nor distinguish smooth from rough surfaces, cold bodies from hot, and that all substances feel of the same temperature, and generally either unusually warm or unusually cold. In some cases motion alone is paralysed, in others only sensation—either of which may continue throughout both this stage and the next.

These symptoms belong as much to the stage of softening as to that of congestion ; for they generally pass so insensibly into each other (often existing together, one part being affected with softening, while in its immediate vicinity congestion exists) that it is impossible to determine where one terminates and the other commences.

*2nd, or stage of softening.*—In considering the symptoms present in this stage, it will be better to commence with the *lumbar portion* of the cord, for it is the part



most liable to be affected, and the one in which the symptoms are most fully marked. There is generally pain in the spine and lower extremities ; rarely severe, however, unless disease of the bones or nerves exists, or the disease is of an active character. With it there is either paralysis of sensation and motion, or paralysis of motion only, the sensation of the parts remaining intact ; or paralysis of sensation only, the power of motion being but little or not at all interfered with. In most cases the paralysis, whether of sensation or motion, commences in the feet, passing upwards, affecting successively the legs, thighs, lower part of the walls of the abdomen, and the bladder and rectum. In some cases, however, the paralysis commences in the muscles of the rectum, bladder or urethra. In the last case, I have known it in two instances produce symptoms which were mistaken for those of stricture of the urethra—the muscles of the thighs, legs, and feet, becoming subsequently affected.

In some cases paralysis of motion alone exists. In the majority of the cases, however, it is observed only for a short time, but in some it continues throughout, the sensation remaining intact, or but slightly affected. In the latter case, and when the paralysis affects the bladder and rectum, the patients continue to feel the desire to pass the contents of these organs, and are quite conscious of their escape, but they are incapable of preventing it.

In some cases, on the other hand, paralysis of sensation alone is observed : in most cases it exists only for a short time before the power of motion becomes interfered

with, but in a few instances it continues throughout by itself, the power of motion remaining intact. In the latter case, when the bladder and rectum become paralysed, the patients still retain the power of evacuating the contents of these organs, but they lose all consciousness of their escape.

The patients generally complain from the first of great uneasiness and fulness or oppression about the lower part of the abdomen, and sometimes of pains of a neuralgic or spasmodic character. The bowels in these cases are often irregular, and they are frequently either unusually purged or obstinately confined. The paralysed parts are affected with pain and numbness of greater or less severity; sometimes, and particularly when the disease excites much irritation, they are affected with agitations, cramps, convulsions, or rigidity with extension or contraction; but these symptoms are rarely strongly marked or of long duration. When either of these states, or a tendency to them, exist, grasping the limbs suddenly, friction over a nerve, or passing a weak current of galvanism along it, tickling or applying a hot plate to the soles of the feet, will excite them, sometimes in both extremities at the same time, sometimes in one more than in the other, or first in one, then in the other. When the parts are motionless and insensible, these measures will generally excite convulsive agitations, sometimes, however, of so slight a nature as to amount only to slight quivering.

CASE XXII.—A male, aged fifty, by trade a shoemaker. He had been much addicted to drinking

throughout life. His health had been good up to his forty-third year, when he was knocked down, the lower part of the back striking with considerable force against a stone. He felt some pain and tenderness in the part, and some stiffness of the back for a week or ten days.

At the end of some months he began to feel slight feebleness of the legs; it gradually increased in intensity, and was accompanied by numbness and pain. About nine months from the commencement of the feebleness in the legs, after an access of fever which lasted three weeks, he lost all power of motion and sensation in the legs and thighs; but he still retained control over the bladder and rectum; later, however, he lost, first the power of controlling the evacuation of their contents, and then all feeling of their escape. He continued in this state for six months—the limbs perfectly motionless and insensible. The urine did not escape, except when pressure was made on the bladder; the bowels were sometimes relaxed, sometimes constipated. He then came under my notice as a parochial patient, suffering from sloughing of the inside of the thighs and scrotum from the contact of the urine, which, in consequence of the bladder being over distended, dribbled away. His pulse was 130, very weak; skin hot; emaciation extreme; limbs motionless, somewhat stiff from disuse rather than from disease of the cord; sensation abolished as high as the crests of the ilia. Tickling or applying a hot plate to the soles of the feet excited but very slight agitations of the flexors of the legs and thighs. The sloughing, although extensive, was unattended by pain.



Death ensued from exhaustion about three weeks after the sloughing had commenced.

*Post mortem.*—The lumbar portion of the cord was in a state of yellow softening, the white and grey portions being equally affected. The vessels in the cellular tissue between the dura mater and the bones were gorged with blood—those of the membranes were enlarged; the spinal canal contained about two ounces of serum. The lining membrane of the bladder was red and ulcerated; this organ contained some troubled ammoniacal urine.

When the *dorsal portion* of the cord is affected, the symptoms will vary somewhat according to whether the disease is seated in the lower or upper part of this region. Thus, when the lower half is affected, the symptoms are the same as when the lumbar region is affected, but the paralysis extends higher on the walls of the abdomen and back. The functions of the stomach and bowels are often interfered with, particularly when the softening is in the centre of this region. Food is often digested with difficulty or pain, and accesses of vomiting, often of a very obstinate character, are very apt to occur.

Pain of the bowels frequently occurs in accesses, or diarrhœa, which often alternates with obstinate constipation. In addition to these symptoms, there is generally a feeling of great fulness of the abdomen, oppression, constriction, or as if the abdomen did not exist.

Sometimes the patients suffer severely from attacks of hiccough, particularly after meals, stimulating fluids,



mental excitement, or on pressing or rubbing the abdomen. In a case which occurred to Dr. Babington,<sup>1</sup> the diaphragm had a great tendency to act spasmodically whenever the walls of the abdomen were touched, and on mental emotion.

When the upper half of the dorsal region is affected, in addition to the above symptoms the arms are more or less paralysed in motion or sensation, sometimes in both, and affected with pain, numbness, agitations, or cramps; the two last are rarely very severe. The walls of the chest are more or less paralysed, and the respiration is carried on by the diaphragm and the muscles of the neck. The arms are very apt to become affected even when the softening does not extend up to the third dorsal vertebra. They are rarely equally affected, one being often affected with paralysis of motion, the other with paralysis of sensation; sometimes only one is affected.

CASE XXIII.—A female, aged forty-three, came under my notice on the 1st of March, 1856, suffering from complete paralysis of sensation of the lower extremities of the abdomen for two inches above the crest of the ilia on each side, with insensibility to the escape of the contents of the bladder and rectum. The urine escaped involuntarily, as did also the fæces; she had the power of controlling the evacuation of the contents of both organs, but only when her attention was directed to them; but when diarrhœa existed, all power over the sphincter ani was lost. In addition to these symptoms

<sup>1</sup> Gull: Medical Times, vol. xix.

she was also suffering from tubercular deposit in the upper part of the right lung, and in the posterior part of the lower lobe of the left, which had existed for about four months. The paralysis of sensation had commenced about twelve months before, first in the calves of the legs and feet, and later in the thighs and abdomen. It had been slowly established; first slight obtuseness being experienced in the skin, which gradually and insensibly increased in severity, until at length complete anæsthesia became established. This state had existed about three months.

She could assign no cause for the disease beyond the sitting for twelve or fourteen hours each day at needle-work. She had been married seventeen years, and had had no children or miscarriage; her menstrual discharge had been regular up to the forty-first year, when it ceased to appear, rather suddenly. There was a strong tendency on the part of her family to disease of the brain; her father and several of his relations had died either from apoplexy or insanity. One out of three brothers was insane, and one liable to epilepsy since childhood.

The muscles of the legs, by the application of a hot plate to the soles of the feet, and a current of galvanism, were thrown into slight contractions. The power of motion did not seem to be materially affected, for she could move the legs freely on the bed, and she could walk; but, from not feeling the ground under her feet, the moment her eyes were removed from it she began to stumble and was in danger of falling.

The disease of the lungs, under the use of cod-liver

oil and counter-irritation to the chest, was considerably mitigated ; but the paralysis of sensation remained unaffected by everything employed ; blisters, counter-irritation, galvanism, and strychnine seemed to extend rather than lessen it. Leeches were applied to the spine, but they produced great depression of strength, although the state of the pulse did not contra-indicate the abstraction of blood.

I lost sight of her at the end of ten weeks for five months. When seen then the disease of the lungs had, from exposure to cold, returned with greater severity, and was accompanied by latent pneumonia. Her pulse was 130, weak ; tongue red and coated with white fur ; thirst intense ; expectoration copious, and of a slight rusty tinge ; skin harsh and dry, and its temperature increased. The lower extremities were completely paralysed in motion ; passage of the contents of the bladder and rectum had ceased to be under control ; the walls of the abdomen were motionless. The skin on the sides and front of the chest was insensible as high as the fifth ribs ; but the muscles were not affected. Death ensued fourteen days after the commencement of the pneumonia.

*Post mortem.*—The cord from the seventh dorsal vertebra downwards was generally softened, but it was more pronounced in the grey portion than in the white. The former was reduced to a semi-fluid condition ; it was of the colour of wine-lees ; the latter was comparatively firm and affected with grey softening. The grey portion from the tenth to the seventh dorsal vertebra was in a similar state ; above this point it was more vascular and



rather deeper in colour than usual, but otherwise quite healthy. The brain and other viscera were not examined.

When the *cervical portion* of the cord is affected there is generally pain of a dull character in the neck, which is often increased by motion, and sometimes by pressure on the sides of the spinous processes; sometimes there is slight rigidity, which interferes with the bending and turning of the head. The paralysis generally commences in one arm, the leg or foot of the same side, and sometimes that half of the body, being more or less feeble—the opposite arm, leg, and side of the body becoming subsequently affected. The paralysis is rarely as strongly pronounced in the leg as in the arm, or so extensively or severely marked in one arm or one side of the body as in the other; neither is the paralysis always of the same character, for one arm is sometimes paralysed in motion, or in motion and sensation, while the other is only paralysed in sensation.

When the disease is progressing, and produces much irritation, the paralysed parts are affected with rigidity and extension or contraction, pains, and sometimes agitations or slight convulsions or cramps, which are aggravated by galvanism and irritation of the skin, or the application of a hot plate.

The patients sometimes complain that the lower part of the body, particularly when the disease affects a considerable portion of the cord, seems separated from the neck and head, and that it either feels extremely cold, like a dead weight, or that the whole or part



of it is not felt. The bladder and rectum, when the disease is extensive, are generally more or less paralysed, and the functions of the stomach and bowels often interfered with. The respiration is very apt to become affected. In some cases this takes place immediately after the disease is developed; in others it is the first symptom observed, and sometimes the only one for some time—the patient may even die from it, death being attributed to disease of the heart. At first, in some cases there is only slight difficulty of breathing observed after food, during exertion, in the night, or on mental emotion; but as the disease progresses the breathing becomes permanently affected. In some instances this symptom is developed rapidly, and induces a fatal termination in a few hours or days; in others it extends over several weeks or months. In these cases its progress is very slow, and it often remains stationary for some weeks, and when it does advance, it takes place in an almost imperceptible manner; but towards the close of life it often becomes suddenly and often severely embarrassed. In some cases the respiration is quickened; in others, and most frequently, it is unusually slow, interrupted, and feeble. The lungs are very apt to become affected with partial congestion, and the bronchia clogged with mucus; dry cough, sometimes of a spasmodic character, exists. The occurrence of difficult respiration is always an unfavourable symptom, and one when it is increasing that invariably indicates a fatal and generally a rapid termination.

The throat is often the seat of a feeling of constriction; there is often difficult deglutition; interrupted, feeble, or

suppressed voice, either from paralysis of the muscles of the larynx, or from the patient being unable to fill the lungs. The tongue is sometimes more or less paralysed ; sometimes there is no apparent defect in it, but the patients lose the power of readily adapting it to modulate the voice, and they either stammer, or the words run one into the other, or parts of words only are altered.

Sometimes the speech remains intact, but the patients lose at times the power of controlling the words uttered, and sometimes they repeat the same words several times in succession, knowing that they are not appropriate, or utter words quite contrary to the meaning they wish to convey.

The muscles of the face are often paralysed ; those of the eyelids and eyes sometimes : the sight is generally defective. The patients generally complain of pain or weight in the head, with great oppression and timidity. In some cases the patients often give way to fits of passion, or they lose all control over their actions. Epilepsy may sometimes occur if the disease excites much irritation ; but the accesses are seldom severe, and rarely more than one or two occur.

The temperature of the skin is rarely increased ; generally it is rather diminished, the patients often complaining of great difficulty in keeping themselves warm ; exposure to very slight cold often depresses it, and it is generally restored with difficulty. The tongue, both in disease of this and the dorsal portion, is generally clean, and when there is much irritation of the stomach it often assumes a bright red colour ; the thirst is gene-

rally marked ; the appetite good ; the urine is sometimes natural, sometimes pale and watery, or loaded with lithates or phosphates ; but when the bladder becomes paralysed, it is thick and fœtid or ammoniacal.

In some cases the brain or its membranes become congested or inflamed, and the patients become either tranquilly or furiously delirious, and then sink into a state of coma, or they pass gradually into the latter without any intervening delirium.

The occurrence of cerebral symptoms, like dyspnœa, is always an unfavourable indication, and is the invariable precursor of a fatal termination.

CASE XXIV.—A male, aged fifty-one, died suddenly in a water-closet, it was supposed from disease of the heart. This was assigned as the cause of death at the coroner's inquest.

After the inquest I obtained permission from his friends, as he had been under my care some months before, suffering from debility and difficulty of breathing, to open the body.<sup>1</sup> There was no disease of the heart, but the ventricles and auricles were greatly distended with dark blood and the lungs congested. There was no change in the brain, but two ounces of serum escaped from the spinal canal when the brain was removed from the skull. The cord, one inch and a half below the medulla oblongata, was softened for half an inch, the right side more than the left ; the softening was yellowish-

<sup>1</sup> Mr. Shaw, of Battersea, kindly assisted me at the post mortem examination.



grey externally, but red towards the centre of the cord ; the former was surrounded by an irregular band of white softening. The vessels ramifying on the surface of the cord at the point where the softening existed were larger than in the rest of the cord.

When seen by me about four months before his death, he complained of weakness of the lower and upper extremities, but without any paralysis of either motion or sensation ; difficulty of breathing on exertion, with short dry cough. His pulse was about 50, and without much power ; respiration feeble and rather slow. Under the employment of diluted nitric acid and sulphate of zinc in decoction of cinchona, he seemed to make some slight improvement, but not sufficient to tempt him to remain long under my care. About a week before his death he took a longer walk than usual, and immediately afterwards a rather hearty dinner. He vomited several times, and afterwards complained of greater feebleness of the legs and arms, and increased difficulty of breathing.

CASE XXV.—A butcher, aged forty, was thrown out of a cart and injured his back in the latter part of June, 1855. He was unable to walk for nearly three weeks, from pain in the spine and a feeling of weakness and numbness in the lower extremities. He also experienced considerable difficulty in retaining his fæces, or evacuating the contents of his bladder. By the application of stimulating embrocations to the back these symptoms



disappeared, and, with the exception of being sooner fatigued, he felt as well as usual.

At Christmas of the same year he worked very hard, and was much exposed to the weather; he also drank to excess, which brought on an attack of delirium tremens, not, however, of a very severe character. This left him very weak, and his temper, naturally mild, became very irritable. In the early part of March he had an attack which was considered to be general chronic rheumatism. The pain was confined to the muscles, the joints being quite free; it was aggravated by cold and motion, but heat did not relieve it. It continued up to the end of March but little influenced by treatment, when he began to experience difficulty in walking, particularly in ascending and descending stairs, from a feeling of stiffness in the legs; it was accompanied by an increase in the state of debility.

In April his right arm became enfeebled and somewhat stiff, and in the course of a few weeks the left also became rather feeble. About this time the pains in the legs gradually increased in severity, and assumed a shooting or tearing character; they were particularly severe at night; at times, when very intense, the legs were affected with a kind of cramp which bound them to the bed, rendering it quite impossible to move them by the effort of the will—the right leg was always more affected than the left. The cramp did not always commence in both legs at the same time; it usually appeared first in the left, and after continuing there for two or three

minutes, passed into the right, which then became similarly affected, the left becoming free; then it would recommence for a short time in the left; but generally both were affected at the same time.

Friction with the hand greatly aggravated the pain and cramps; cold did the same, but not so severely; flannels dipped in hot water produced some relief, but it was almost necessary that the skin should be scalded before this was effected. These attacks were always followed by increased debility of the lower and upper extremities.

On the 10th of April, 1856, he was taken, after eating freely and drinking several glasses of spirits and water, with a slight fit, which, from the description of his wife, seemed to be of an epileptic character. It was followed by increased feebleness of the legs and arms.

Seven days after the fit he was brought under my notice. He then presented the following state:—legs and thighs benumbed, but this was more marked below than above the knees; the cutaneous sensibility of the skin of the latter parts was also rather obtuse; he could move the legs on the bed, but not raise them, and when placed on his feet they trembled, and, if he was not supported, they yielded under the weight of his body; he had perfect control over the bladder and rectum; the bowels were very confined, not acting more than once in seven or ten days; the motions hard and lumpy, and their evacuation excited severe pain in the rectum, which shot down the legs to the soles of the feet and up the sides of the buttocks, and excited incessant attempts

to pass water—the latter continued some time after the motions had been evacuated and the pain in the legs had subsided; the urine since the fit has been high-coloured, but before it was rather pale, and considerable quantities were passed—it was loaded with phosphates; the skin was harsh and dry; pulse 45, and without much power; heart's action weak; respiration weak; voice feeble; slight feeling of constriction in the throat, but no difficulty in swallowing; tongue slightly coated with white fur; the arms were moved with difficulty, particularly the left; sensation was obtuse in both, but it was much more marked in the left.

Tickling or applying a hot plate to the soles of the feet or the palms of the hands did not throw either the legs or arms into agitations or convulsions, but excited a state of painful cramp-like rigidity; rubbing the parts with the hands produced the same effect; pinching or pressing the muscles or the large nerves excited pain; there was slight stiffness of the neck, and motion of the head was painful, and if continued for any length of time excited severe pain of a neuralgic character in the muscles of the neck, which caused them to become rather rigid. His appetite was good; but food, unless of the lightest kind, was digested with difficulty. He took a considerable quantity of stimulants in the course of the twenty-four hours; they seemed to form his chief support. His mental powers had failed considerably since the fit; he complained of weight in the head; the sight of the left eye was defective, that of the right was weakened, and in looking at any object he always brought it



close to the latter eye. There was no alteration in the size of the pupils, neither of which contracted readily under a strong light.

A blister was applied to the neck, and kept open by dressing it with irritating ointment. At first it produced no effect on the disease ; but later, from the skin becoming inflamed, it rather increased the pain in the neck. He received most benefit from morphia, with iodide of potassium, three times a day, and small doses of calomel every second night. By using tepid soap and water enemas every morning, he escaped the severe attacks of pain in the legs and buttocks, and the desire to pass water.

As no material benefit could be hoped for from treatment, I ceased to visit him after a fortnight's attendance.

I was requested to see him again on the 8th of May. He was then suffering from severe spasmodic vomiting, brought on by eating and drinking too freely on the 3rd. Everything taken, whether liquid or solid, was rejected with great force immediately on entering the stomach. The exhaustion was extreme ; pulse very feeble, respiration the same ; slight tranquil delirium, particularly at night. A blister had been applied to the epigastrium, and hydrocyanic acid with morphine given internally, but without effect. Injecting one drachm of sedative solution of opium in half a teacupful of gruel into the rectum, and dressing the blistered surface with a paste made with half a drachm of tincture of aconite and one grain of morphine, allayed the vomiting, and enabled him to take small quantities of essence of meat and



turtle soup. He never rallied, however, and it was only by keeping up the effect of the opiate that the vomiting could be prevented from returning.

When seen on the morning of the 14th, he expressed himself as feeling much better; but his features were pale and pinched, pulse slow and weak, and respiration feeble and rather embarrassed. There was slight mucous râle over a considerable portion of the chest. The paralysis did not seem to have increased.

The respiration became gradually more and more embarrassed, from the accumulation of mucus in the bronchial tubes, and death ensued on the 16th.

*Post-mortem four days after death.*—It was with the greatest difficulty that permission could be obtained to examine the spinal canal.

The integument of the back was of a deep purple colour, and the skin on the sacrum superficially ulcerated. The muscles of the back were infiltrated with dark-coloured blood. The vessels of the cellular tissue between the vertebræ and the dura mater, and those of the dura mater and the other membranes of the cord, were gorged with dark-coloured blood. The cord, also, was rather more deeply coloured than usual. These states were evidently the result of the position of the body. The arachnoid membrane from the third to the sixth cervical vertebra was slightly opaque; the pia mater from the second to the fourth was similarly affected: the opacity was more marked posteriorly than anteriorly. The cord corresponding to the opacity of the pia mater was softened, which affected the whole of

its circumference ; but it was more marked posteriorly than anteriorly and laterally. Under the microscope granular corpuscles, granules, oil globules, with broken-up nervous substances and cellular tissue, were found.

CASE XXV.—A female, aged forty-two,<sup>1</sup> came under my notice on the 7th of July, suffering from disease of the cervical portion of the cord. The following is the history of her case, obtained with some difficulty, her memory being rather defective :—

Nine years ago her left side gradually became weak, and the left side of her face and left nostril paralysed, and a year and a half ago the right arm became weak. She has had ten children, the youngest being four months old. Since its birth she has grown worse, and during the last three weeks she has suffered much from noises in the head, and great feebleness in walking, her legs threatening to yield under the weight of the body ; she cannot stand on either leg ; her sight has also failed ; she frequently utters words she does not mean, and at times suffers severely from a dread of some impending evil, which impels her to rush into the open air.

She suffers from pain in the back of the neck ; at times it is very severe, causing the head to become stiff. The shoulders have sometimes a tendency to be drawn upwards towards the head ; breathing and deglutition are sometimes difficult ; sensation of the right arm, she

<sup>1</sup> I am indebted to Mr. Shaw, of Battersea, for the opportunity of seeing this case.

states, is more acute than the left; she can use the former in putting up the hair on the back of her head, but if she places the hand under the head for a short time it has a tendency when she removes it to be jerked back again. She cannot hold this arm in a flexed position for any length of time.

The paralysis was preceded by very severe pain of some duration, and a tendency to contractions and convulsive jerks. A few days ago the legs had a tendency to contract; she complains that the abdomen feels as if drawn back to the spinal column. Her gait is feeble and rather tottering, and she feels as if treading on a rough surface; bowels very confined, scarcely ever acting without an enema; she has complete control over the bladder and the sphincter ani, except when diarrhœa occurs, then the evacuations pass involuntarily, but she is quite conscious of their escape. She suffers severely at times from tenesmus and prolapsus ani; then she has frequent desire to pass water. Her pulse is feeble and slow—55; respiration also rather slow and feeble. She has emaciated since the birth of her child, although never suckled by her. The tongue is at present rather white, and during the last few days there has been slight diarrhœa. She experiences slight difficulty in bending the head, from a feeling of stiffness in the muscles of the neck, and there is some tenderness on pressure along the sides of the spinous processes of the lower cervical vertebræ, particularly on the right side.



## DURATION AND TERMINATION.

1. *In softening of the lumbar portion.*—Softening of the lumbar portion of the cord is not a fatal disease. I am acquainted with persons who have laboured under the disease for a number of years. When death ensues it generally occurs from disease of the brain or its membranes, disease of the cervical portion of the cord, disease of the kidneys, bladder or bowels, or sloughing of the thighs, scrotum or sacrum, or exhaustion. Out of eight cases which proved fatal, in one, death ensued from cerebral meningitis;<sup>1</sup> in a second, death was preceded by headache, which was followed by delirium and sloughing of the sacrum;<sup>2</sup> in a third, death ensued from apoplexy;<sup>3</sup> in a fourth, from asphyxia, from acute softening of the cervical portion;<sup>4</sup> in a fifth, from coma, consequent on suppression of urine;<sup>5</sup> in a sixth, from sloughing of the inside of the thighs and scrotum;<sup>6</sup> in a seventh, from exhaustion—the patient, a male, had had fever, perspirations, quick pulse, and vomiting;<sup>7</sup> in an eighth, from epidemic dysentery.<sup>8</sup>

2. *In softening of the dorsal portion or of the dorsal and lumbar portions.*—Softening of the lumbar and dorsal portions, or of the dorsal portion alone, seems to be rather more liable to prove fatal than softening of the lumbar portion alone. When death does ensue, it is generally from nearly the same causes that give rise to a fatal termination when the lumbar portion is softened;

<sup>1</sup> Myself.<sup>2</sup> Prus.<sup>3</sup> Myself.<sup>4</sup> Prus.<sup>5</sup> Myself.<sup>6</sup> Ibid.<sup>7</sup> Astley Cooper.<sup>8</sup> Hutin.



the lungs and stomach are, however, more liable to become affected.

Out of twelve cases which proved fatal, death ensued in six from sloughing of the sacrum ; in one case, the respiration became embarrassed two days before death ; in another, small-pox existed ;<sup>1</sup> in a seventh, it ensued from coma and difficult respiration, the cortical substance of the brain was found injected, and the white substance unusually firm ;<sup>2</sup> in an eighth, suffering from epilepsy which had ended in idiotism—death ensued from convulsions—the membranes and the substance of the brain were injected ;<sup>3</sup> in a ninth, death ensued from disease of the lungs ;<sup>4</sup> in a tenth, from asphyxia ;<sup>5</sup> in an eleventh, from fever and emaciation, the membranes of the base of the brain were injected and covered with yellow exudation, the cavernous sinuses and the commencement of the carotid veins contained yellow purulent matter, and the veins of the abdomen brown ichorous fluid—the lungs were hepatized, and contained abscesses ;<sup>6</sup> in a twelfth, from frequent vomiting, and fever, with delirium.<sup>7</sup>

The duration of the disease varies. When the softening is confined to the lower third or half of this region, life, as in the cases in which the lumbar portion of the cord is affected, may be prolonged for years ; but when the upper half or third is implicated, the disease is

<sup>1</sup> Louis : *Recherches d'Anat. Pathologique*.

<sup>2</sup> Breire : *Nouvel. Bib. Med.*, 1826, tome ii.

<sup>3</sup> Pinel fils.

<sup>4</sup> Myself.

<sup>5</sup> Maisonneuve : *Revue Med.*, 1833.      <sup>6</sup> Rokitsansky.

<sup>7</sup> Barbier : *Traité de Therapeut.*, tome iii.

very apt to prove fatal, either from the occurrence of congestion or of softening of the cervical portion of the cord. The duration, however, will greatly depend upon the activity and extent of the disease, and whether disease of the lungs, stomach, brain, or sloughing of the sacrum or thighs, set in. The occurrence of either of the foregoing, particularly if they are severe and increasing, is generally followed by a fatal result.

3. *In softening of the cervical portion, or of the cervical and dorsal portions.*—Softening of the cervical portion of the cord seems to prove invariably fatal. Death generally ensues from disease of the brain or its membranes, from asphyxia, exhaustion, or sloughing of the sacrum.

Out of seventeen cases which proved fatal, death ensued in four of the number from disease of the brain or its membranes, generally of the latter; in ten, from asphyxia—in one case, the patient had, from fright, been subject to epilepsy for some time, which at length ended in insanity;<sup>1</sup> in a fifteenth, from typhus;<sup>2</sup> in a sixteenth, death ensued from exhaustion;<sup>3</sup> and in a seventeenth, from sloughing of the sacrum.<sup>4</sup>

The duration of the disease varies, much depending on its activity, extent, and position. In some cases where it was active and situated high in the cervical region, or when situated low down, if accompanied by congestion of the upper part, death often ensued in a few days or weeks. The occurrence of difficult respira-

<sup>1</sup> Calmeil.

<sup>2</sup> Reid.

<sup>3</sup> Webster: *Medico-Chir. Transact.*, vol. xxvi.

<sup>4</sup> Abercrombie.

tion, particularly when the disease is increasing, is always a very unfavourable symptom, and is generally a certain indication of a fatal and often speedy termination; the same may be said whenever cerebral symptoms or extensive sloughing of the sacrum occur.

4. *In general softening of the whole cord, or of one or other of its columns.*—Softening of the whole of the cord, or of one or other of its columns, does not seem to be frequently met with. Death generally ensues in the former, before the cord becomes completely softened, either from asphyxia, sloughing of the sacrum, or some other disease; in the latter, from disease of some other organ; for softening of one of the columns, unless considerable congestion of the cervical portion occurs, does not seem very liable to prove fatal.

DIAGNOSIS OF CHRONIC SOFTENING OF THE CORD FROM  
CHRONIC SPINAL MENINGITIS AND FROM INDURATION  
OF THE CORD.

1. *Softening of the cord.*      1. *Chronic spinal meningitis.*

Numbness and pain exist; they are often very severe: paralysis of motion and sensation are constant; sometimes paralysis of motion or of sensation alone is present, but generally only for a time.

Numbness and pain exist, but they are rarely severe or general. Paralysis of motion is present, but it is rarely complete, unless the cord be congested or the nerves deeply imbedded in hardened inflammatory exudation. Sensation is rarely extensively affected.



Softening of the cord is very apt to occur in chronic spinal meningitis.

2. *Softening of the cord.*

Rigidity, with extension or contraction, rare, or only marked for a short time. Shocks of pain, cramps, agitations, or convulsions, rarely strongly marked or of long duration. General convulsions are but seldom observed, neither do they ever assume a very severe character, or continue for any length of time. Increased cutaneous sensibility is very rarely observed.

2. *Induration of the cord.*

Rigidity, with extension or contraction, frequent, severely marked, and of long continuance. Shocks of pain, cramps, agitations or convulsions, frequent, and continue for some time. General convulsions, particularly when the cervical portion of the cord is affected, occur constantly, and are often severe. Increased cutaneous sensibility is frequently observed, and it often continues for some time.

TREATMENT.

1st, *Of the stage of congestion.*—The repeated local abstraction of blood from the spine, either by leeches or cupping, if the system will admit of it, generally proves of the greatest service. In some cases, however, the loss of even a small quantity of blood produces great debility. When this occurs counter-irritation and blisters, setons, or caustic issues kept open for some time, may be had recourse to, sometimes with considerable relief; but in others, particularly when much irritation is excited,



aggravation of the symptoms ensues. In the latter case, allowing a stream of warm or cold water strongly impregnated with bay salt to fall on the back for five or ten minutes twice a day, from a height of six or eight feet, is often of considerable benefit. It should be steadily persevered with for several weeks.

In some cases the system may be brought slightly under the influence of mercury (if nothing exists to contra-indicate its use), particularly when the congestion is extending, with benefit; in others, when emaciation or anæmia exists, the iodide of iron and cod liver oil seem to prove of the greatest service. No treatment can be of material benefit, however, if the strictest rest is not at the same time observed.

*2nd, or stage of softening.*—A cure can scarcely be hoped for, particularly when the softening is extensive and occupying the whole thickness of the cord. The efforts of the practitioner must be, therefore, directed to prolonging life, first, by preventing the disease from extending and congestion occurring; secondly, by removing pain and irritation or disease of the bladder, bowels, stomach, or lungs; and, thirdly, to prevent the occurrence of sloughing of the sacrum or scrotum and thighs.

The first may be generally prevented by strict rest, and carefully avoiding exposure to cold or wet. If the disease threatens to extend, blood should be removed from the spine either by leeches or cupping, or recourse should be had to counter-irritation, setons, or caustic issues. The latter remedies sometimes excite much irritation, and aggravate rather than relieve the symptoms.

When the pain in the spine is severe, and a tendency exists on the part of the limbs to be thrown into agitations, the abstraction of blood seems to be more beneficial than counter-irritation. Great care, however, must be observed, that too much blood is not withdrawn; for the removal of a very small quantity is sometimes followed by great exhaustion, from which the patient recovers with difficulty.

Pain and irritation is most effectually relieved by morphine, or sedative solution of opium in large doses alone, or with tincture of aconite in doses of from five to seven or ten minims, and chloric ether in doses of from ten to twenty or twenty-five minims. In some cases, particularly when the lower extremities or lower part of the body is the seat of pain, or the stomach is very irritable, opiate injections or suppositories seem to act more effectually than opiates given by the mouth.

The diet should be light and nourishing. Stimulants, except the patients have been accustomed to them, act injuriously rather than beneficially; they should, therefore, always be curtailed as much as possible.

The bowels should be carefully regulated, either by the occasional exhibition of a dose of castor oil, or what is better—an enema of soap and water every morning.

The mind should be kept as tranquil as possible, particularly when the upper part of the cord is affected. Exposure to cold or wet, or bodily fatigue, must be carefully guarded against.

## CHAPTER VI.

## APOPLEXY OF THE CORD.

SYN.—*Paralysis from effusion of blood into the substance of the cord or into the spinal canal.*

CHARACTERISTICS.—*Sudden and severe pain in the spine, followed immediately or in a short time by paralysis of motion and sensation, or of sensation or motion alone. When the blood is effused into the spinal canal and increasing in quantity, the paralysis ascends, generally affecting first the feet, then the legs, thighs, abdomen, chest, and arms; but when it is effused into the substance of the cord, the whole of the body below the point into which the blood has escaped becomes immediately or in a short time paralysed.*

## CAUSES.

I. PREDISPOSING. — *Sex and age.* — Males seem decidedly more predisposed than females to this lesion, at least after the tenth year, from their being more exposed to the accidents most liable to cause it. Out of fifty-eight cases which I have collected and observed, forty-one of the number were males and seventeen females. The predisposition seems to be most strongly pronounced—as will be seen from the following table of the ages and sex of fifty cases—in males from the tenth to the twentieth year, from the twenty-fifth to the thirtieth, from the thirty-fifth to the fortieth, and from the forty-fifth to the seventieth.



	Males.	Females .	Total.
From birth to 1 month	2	—	2
From 1 month to the 4th year	—	—	—
From 4th to the 10th year	2	2	4
" 10th to the 15th "	5	2	7
" 15th to the 20th "	4	1	5
" 20th to the 25th "	1	—	1
" 25th to the 30th "	6	3	9
" 30th to the 35th "	2	1	3
" 35th to the 40th "	4	—	4
" 40th to the 45th "	1	—	1
" 45th to the 50th "	2	1	3
" 50th to the 60th "	4	—	4
" 60th to the 70th "	3	2	5
Beyond the 70th year	(85) 1	(72) 1	2
Total... ..	37	13	50

II. EXCITING.—The most frequent exciting causes seem to be blows or falls on the spine, over-exertion, great fatigue, and caries or cancer of the vertebræ. Tetanus and acute inflammation of the cord or of the spinal membranes sometimes cause blood to be effused into the canal.

In a great number of cases the lesion occurred from no assignable causes, or from very slight ones. The patients in these cases were generally advanced in years, and fatty degeneration or alteration of the walls of the blood-vessels of the membranes or of the cord was generally found after death. In some cases it was preceded by gout or rheumatism; or the patient had had one or more attacks of apoplexy, or suffered from disease of the brain or its membranes.

In fifteen cases the lesion was excited by blows or falls on the spine: in one case, a male,<sup>1</sup> by a blow from

<sup>1</sup> Morgagni: De Sed. et Caus. Morb.



a piece of wood ; in a second, a male,<sup>1</sup> from a blow on the dorsal portion of the spine ; in a third, a male, aged thirty,<sup>2</sup> from a sack falling on his back ; in a fourth, a male, aged fifty,<sup>3</sup> from being thrown against a gas-post by the shafts of a carriage striking him on the chest ; in a fifth, a female, aged sixty-three,<sup>4</sup> from the wheels of a carriage passing over her back ; in a sixth, a male, aged twenty-six,<sup>5</sup> from several cartloads of gravel falling on him ; in a seventh, a male, aged fifty,<sup>6</sup> from a fall from a hay-loft ; in an eighth, a male, aged thirty-nine,<sup>7</sup> from falling down a flight of stone steps when intoxicated ; in a ninth, a male, aged sixty-eight,<sup>8</sup> from falling down stairs ; in a tenth, a male,<sup>9</sup> from falling from a haystack ; in an eleventh, a male, aged thirty-five,<sup>10</sup> from a fall by which he had injured his loins eleven days before the apoplexy occurred ; in a twelfth, a male, aged fifteen,<sup>11</sup> from falling on the back of the head from a height of twelve feet ; in a thirteenth, a male, aged eighty-five,<sup>12</sup> from falling, the head striking against the floor ; in a fourteenth, a male, aged fourteen,<sup>13</sup> from being jerked out of a swing by a rope being thrown over his head ; in a fifteenth, a male,<sup>14</sup> from a lifting a sack of flour.

<sup>1</sup> Astley Cooper's Lectures on Surgery.

<sup>2</sup> Auvert : *Selecta Prax. Medico-Chir.*, tab. xxviii.

<sup>3</sup> Myself.

<sup>4</sup> Ibid.

<sup>5</sup> Ibid.

<sup>6</sup> Bergamaschi : *Sulla Miele Steneco e Sul Tetano*.

<sup>7</sup> Myself.

<sup>8</sup> South : *Chelius's Surgery*, i. 534.

<sup>9</sup> Charles Bell : *Injuries of the Spine*.

<sup>10</sup> Peddie : *Edin. Med. Jour.*, 1847.

<sup>11</sup> Macfarlane's Clinical Reports.

<sup>12</sup> Howship : *Observations on Surgery*.

<sup>13</sup> Myself.

<sup>14</sup> Chevalier : *Medico-Chir. Transact.*, vol. iii.

In nine cases, the lesion was excited by fatigue or over-exertion. In one, a male, aged sixty-one,<sup>1</sup> from a long journey in a diligence—he had suffered for some time from pain in the back; in a second, a male, aged sixty,<sup>2</sup> it was excited by a similar cause; in a third, a male, aged forty,<sup>3</sup> addicted to drinking, from carrying heavy loads, by which he was greatly fatigued; in a fourth, a male, aged twenty-nine,<sup>4</sup> by a long journey, exposed to the heat of the sun; in a fifth, a female, aged twenty-seven,<sup>5</sup> by a long walk, she had been suffering for some time from pain in the back and head; in a sixth, a male,<sup>6</sup> by severe exertion; in a seventh,<sup>7</sup> a male, by severe labour; in an eighth, a male, aged thirty-one,<sup>8</sup> it occurred while at work sawing wood; in a ninth, a male, aged twenty-three,<sup>9</sup> after great exertion and mental excitement at a fête.

In five cases the lesion was excited by caries of the vertebræ. In one case, a male, aged eleven;<sup>10</sup> in a second, a male, aged twelve;<sup>11</sup> in a third, a female, aged twenty-nine;<sup>12</sup> in a fourth, a male, aged nineteen; in a fifth, a female, aged thirty-three,<sup>13</sup> from syphilitic caries of the fourth cervical vertebra, by the extension of the ulceration from the pharynx.

<sup>1</sup> Gaultier de Claubry : Jour. Gén. de Méd., 1808.

<sup>2</sup> Bellingeri : An. Univ. di Med., 1824.

<sup>3</sup> Grissolo : Jour. Hebdom., tome i. 1836.

<sup>4</sup> Colligny : Arch. Gén. de Méd., 1836.

<sup>5</sup> Saccheo : Repert. del Piedmont, 1834.

<sup>6</sup> Topham : Lancet, 1852. <sup>7</sup> Bergamaschi, osserv. v.

<sup>8</sup> Niel, in Clot. Sur. le Spinitis Montpel. 1820. <sup>9</sup> Ibid.

<sup>10</sup> Weber : Jour. Hebdom., 1825.

<sup>11</sup> Payen, Rillet, and Barthez, Malad. des Enfants, ii. 74.

<sup>12</sup> Myself. <sup>13</sup> Leprester : Arch. Gén. de Méd., 1830.

In two cases it was excited by cancer of the vertebræ.<sup>1</sup> Both the patients were females : one was suffering from cancer of the breast ; the other had had the cancerous breast removed, but the disease had returned.

In nineteen cases the lesion occurred during the existence of various diseases. In one case, a male, aged thirty-one,<sup>2</sup> it occurred during the existence of secondary syphilis ; in a second, a male, aged forty-four,<sup>3</sup> liable to gout during spasms of the stomach ; in a third, a male, aged thirty-nine,<sup>4</sup> on pains of a rheumatic character of nine months' duration ; in a fourth, a male, aged forty-eight,<sup>5</sup> liable to rheumatism, habitual constipation, and derangement of the organs of digestion,—he had at first an attack of paralysis of the left side of the body, with slight disorder of the mind and speech ; but after the first shock the paralysis assumed a paraplegic character. He lived a year, during which he had, from mental anxiety or errors in diet, several minor attacks. Death ensued in thirty-six hours, and was preceded by the successive extinction of speech, deglutition, and muscular power ; the respiration becoming affected thirty-six hours before death. In a sixth case, a delicate female, aged fourteen,<sup>6</sup> nearly complete hemiplegia of the right side had existed, but had nearly disappeared under treatment, when general paralysis became established by degrees ; in a seventh, a male, aged thirty-

<sup>1</sup> Brodie : *Lancet*, 1843-4.

<sup>2</sup> Stafford : *Diseases of the Spine*.

<sup>3</sup> Curling : *Patholog. Transac.*, vol. iii.

<sup>4</sup> Ogle : *Ibid.*, vol. iv.

<sup>5</sup> Stroud : *Bright's Reports of Medical Cases*, case cxlii.

<sup>6</sup> Clot.



six,<sup>1</sup> pain had existed in the neck, with difficulty in moving the left arm and leg, four or five years before, but had yielded to treatment in the course of three months; in an eighth, a delicate male, aged eleven,<sup>2</sup> pain in the neck had existed for about four months, when severe headache set in, followed in fourteen days by paralysis of the arm, and in seven days later by an increase in the severity of the pain of the head, increased rapidity of pulse, and later by suffocation; in a ninth, the patient, a male, aged sixty-one,<sup>3</sup> had had several attacks of apoplexy; in a tenth, a female, aged seventy-two,<sup>4</sup> it occurred in connection with cerebral apoplexy; and in an eleventh, a female, aged eight,<sup>5</sup> with disease of the brain. In a twelfth case, a female, aged fifteen,<sup>6</sup> who had not yet menstruated—after suffering from severe headache for three months, convulsive shocks of the body set in, followed by apoplexy; in a thirteenth, a male, aged seven,<sup>7</sup> it was preceded by headache; in a fourteenth, a male, aged fifty,<sup>8</sup> suffering from chronic spinal meningitis and softening of the dorsal portion of the cord; in a fifteenth, a female, aged twenty-five,<sup>9</sup> it occurred during typhus fever; in a sixteenth, a female, aged forty-five,<sup>10</sup> during convalescence from typhus fever;

<sup>1</sup> Cruveilhier: *Anat. Pathol*, livr. iii.

<sup>2</sup> Yvareu: *Diss. de Paris*, 1831.

<sup>3</sup> Hutin: *Biblioth. Medicale*, 1828.

<sup>4</sup> Myself. <sup>5</sup> Maunthner: *Krank. des Gehirns*.

<sup>6</sup> Barbier: *Traité de Mat. Méd.*, tome i.

<sup>7</sup> Abercrombie.

<sup>8</sup> Myself.

<sup>9</sup> Hornung: *Osterrich. Med. Jahrbücher*, band xii.

<sup>10</sup> *Med. Zeitung*, cited in Schmidt's *Jahrbücher*, 1841.



in a seventeenth, a female, aged six,<sup>1</sup> from exposure to cold when covered with perspiration; in an eighteenth, a male, aged ten,<sup>2</sup> it occurred after cholera; and in a nineteenth, a male, aged four,<sup>3</sup> on hooping cough.

In nine cases it occurred suddenly. This was the case in a female, aged thirteen;<sup>4</sup> in a second case, a male, aged fifty-five;<sup>5</sup> in a third, a male,<sup>6</sup> probably advanced in years; in a fourth, a male,<sup>7</sup> also advanced in years; in a fifth, a male, aged twenty-nine;<sup>8</sup> in a sixth, a male, aged twenty,<sup>9</sup> the patient in this case had spat blood; in a seventh, a male, aged twenty-nine;<sup>10</sup> in an eighth, a male, aged fifty-three,<sup>11</sup> addicted to drinking; in a ninth, a male, aged thirty-three,<sup>12</sup> addicted to drinking, and suffering from disease of the heart; in a tenth, a female, aged sixty-eight,<sup>13</sup> in a state of extreme emaciation and amentia.

Apoplexy of the cord sometimes occurs in the child while in the womb or during labour, particularly when it is very much protracted, from the head being born some time before the body, or from the cord being wound several times round the neck. In four cases which have

<sup>1</sup> Maunthner.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Bellingeri: cited in London Med. Jour., 1834.

<sup>5</sup> Bouillaud: Jour. Hebdom., 1829, tome ii.

<sup>6</sup> Duverney: Hist. de l'Acad. des Sciences, an 1688.

<sup>7</sup> Duhamel: Reg. Scient. Acad. Hist., an 1683.

<sup>8</sup> Monod: Bul. de la Soc. Anat., 1832.

<sup>9</sup> Fallot: Jour. Complément, tome xxxvii.

<sup>10</sup> Service de Breschet, Gazette des Hôpitaux, 1830.

<sup>11</sup> Hornung.

<sup>12</sup> Glendinning: Pathol. Trans., vol. i.

<sup>13</sup> Ibid.

fallen under my observation, blood was also extravasated on the surface of the brain.

#### CHANGES FOUND AFTER DEATH.

The blood may exist—

1. External to the dura mater.
2. In the arachnoid cavity.
3. Between the arachnoid membrane and the pia mater.
4. In the substances of the cord.
5. In the substances of the cord and between the membranes.

1. Blood is rarely effused in considerable quantities external to the dura mater. When found, it is generally in connection with acute inflammation of the cord or its membranes, or tetanus. It is sometimes found after injuries of the spine.

2. Effusion into the cavity of the arachnoid is more frequently observed than on the dura mater. The quantity effused is generally considerable, often filling the whole of the canal as high as the foramen magnum, and sometimes extending over the cerebellum, or into the base of the brain.

3. Effusion between the arachnoid and pia mater is more frequently met with than either of the two others. The blood forms a layer of variable thickness bound down by the arachnoid; it generally extends over a considerable portion of the cord, unless confined to the cervical region, then the quantity may be small. It

sometimes co-exists with blood on the surface or base of the brain, or in the substance of the cord.

4. Effusion into the substance of the cord seems to be also of frequent occurrence. It sometimes occurs in connection with effusion of blood into the brain, particularly the fourth ventricle; the blood in the latter case is generally situated in the medulla oblongata, or in the cervical region between the pia mater and arachnoid.

The quantity of blood effused varies; in the cervical region, particularly the upper part, it is often very small, not larger than a pea or a small kidney bean; in the lower part of this region it seems necessary that it should be much larger to destroy life in a short time.

The grey portion of the cord is the part into which the blood is always effused; in some cases it remains in it, extending and breaking it up sometimes for a considerable distance, the white remaining intact; in others it breaks through the white portion, destroying it more or less extensively, and occupying a considerable portion of the spinal canal.

The changes found in the substance of the cord also vary. In some cases, particularly those in which the blood has been effused in consequence of severe injury, and death has ensued in a short time, the débris of nervous substances will be found mixed with the blood, but it will present no alteration under the microscope; but when the effusion has been preceded or followed by acute or chronic softening, then the microscope will demonstrate the existence of granular corpuscles, granules,



fat globules (in the chronic), and altered blood-vessels and nervous structures.

When death does not ensue until some days after the effusion has taken place, acute softening of the cord or acute inflammation of the membranes is frequently found. When life is prolonged for some time, chronic softening of the cord is apt to ensue.

#### SYMPTOMS.

The symptoms will vary according to the quantity of blood effused ; its position, whether seated in the lumbar, dorsal, or cervical region, in the substance, or on the surface of the cord.

The escape of the blood may be preceded by symptoms of acute inflammation of the substance of the cord or its membranes, or chronic softening of the cord, or chronic inflammation of the membranes, or congestion. In the cases in which the blood was poured out in consequence of injury of the spine, it was rarely preceded by symptoms of disease of the cord.

The symptoms will be best considered under the form of *effusion between the membranes*, and *effusion into the substance of the cord*.

1. *Effusion of blood between the membranes*.—The following is the course the symptoms generally take, their severity and rapidity of formation depending on the quantity and rapidity with which the blood is effused. The patients, in from a few minutes to a few hours after the occurrence of the rupture of the blood-vessel, complain—from the blood gravitating toward the lower part



of the spinal canal—of paralysis of the feet, whence it ascends more or less rapidly to the legs, thighs, abdomen, chest, and arms. There is generally at the same time pain in the back, sometimes of a very severe character. When the paralysis reaches the lower part of the abdomen, retention of urine and involuntary escape of the contents of the rectum; and when it reaches the walls of the chest, difficulty of breathing; the patient at length dying from asphyxia.

The extremities are rarely, if ever, unless the effusion has existed some days, and given rise to acute inflammation of the membranes, affected with agitations, contractions, or convulsions. In two cases the patients were seized with general convulsions. In one, the patient, a female, aged fourteen,<sup>1</sup> after suffering for some days from pains in the head and back, sought medical assistance. The headache was relieved by blisters and aperients, but the pain in the back increased in severity, and was accompanied by a tendency to sickness on sitting up. The effort to sit up distressed her much. Her face was calm; tongue rather white; pulse 120, of moderate fulness. She was taken suddenly with violent increase of the pain in the back, and immediately fell into convulsions, continuing in them for five or six hours, when she expired.

In the second case, the patient was a female, aged forty,<sup>2</sup> suffering from pains in the head and back. In the course of a few days the pain in the back became

<sup>1</sup> Chevalier : *Medico-Chir. Transact.*, vol. iii.

<sup>2</sup> Ollivier : cited by Mayo, *Outlines of Pathology*.

very acute, and violent convulsions set in, which continued for five or six hours, when she expired.

The paralysis is generally more extended when the patient is in the horizontal position, particularly if a considerable quantity of blood has escaped. When the walls of the chest are affected, depressing the head and shoulders will, by causing the blood to gravitate towards the upper part of the canal, excite suffocation, immediately when it is in the arachnoid cavity, but more slowly when it is situated between the arachnoid and pia mater; in the latter case, the occurrence of the suffocation will depend upon whether the blood can gravitate readily or not, according to the position of the body.

CASE XXVI.—A male, aged fifty, was brought into the Hôtel Dieu, on the 23rd of December, 1841, with paralysis of the lower extremities.

On the evening of the 21st he had been driven against a gas-post by the shafts of a cabriolet striking him on the chest. He felt no inconvenience at the time beyond slight pain in the back, giddiness, and faintness, and was able to walk home a distance of half a mile.

In ascending the stairs to his room on the sixth floor, he experienced numbness in the feet and considerable pain in the back, and on reaching his room vomited some coffee and brandy which he had taken a short time before the accident. The next morning he was unable to move his legs, and during the day and next night the paralysis increased, and by the morning of the third

day it had reached high enough in the trunk to interfere with the respiration.

On admission he presented the following state :—

Face calm, but extremely pale : mind intact ; respiration difficult, from a feeling of great oppression at the lower part of the chest ; he had a great dread of being placed in a horizontal position, as he said “ that he felt as if he should die from suffocation if he was laid straight in the bed ;” pulse 74, weak, and rather irregular ; heart’s action the same ; complete paralysis of motion of the whole of the body below the false ribs, and nearly complete paralysis of sensation, for he scarcely felt the prick of a pin ; bladder distended, no urine having been passed since the accident. He had passed a motion involuntarily yesterday.

Leeches were applied to the anus, and the catheter introduced to draw off the urine.

On the morning of the third day, at 8 A.M. the paralysis had extended up the walls of the chest ; the breathing was very quick and nearly imperceptible ; heart’s action and pulse scarcely to be felt ; face of a leaden hue ; voice scarcely perceptible ; deglutition impossible ; mind intact. Death ensued at 10 A.M. without any alteration in the symptoms.

*Post mortem.*—On opening the skull a large quantity of blood escaped from the back part of the head ; it evidently came from the spinal canal. The latter when opened still contained a considerable quantity of blood, but its source could not be discovered ; blood also existed in the cellular tissue between the dura mater and the



bony canal and in the muscles of the back, but not in considerable quantities. There was no other lesion.

Of two other cases which have fallen under my notice in which the blood was effused into the spinal canal; in one, a male, aged twenty-six, who had been buried by the falling of several cartloads of gravel upon him, death ensued very soon after he was extricated. The state of the limbs was not noticed. His skin was cold; pulse and heart's action scarcely perceptible; he was speechless, but seemed conscious of what was passing around him.

He had passed both urine and fæces involuntarily immediately after his removal from the gravel. He was placed in a warm bed; bottles filled with warm water were applied to his body, and mustard poultices to his feet and legs; hot brandy and water and stimulants were freely administered. These measures restored the heart's action somewhat, and rendered him rather more conscious. The benefit was, however, only transitory. The breathing became gradually weaker, and for twenty minutes before death it was nearly imperceptible.

*Post-mortem.*—Blood was found at the base of the brain and in the spinal canal. The spinous process of the eleventh dorsal vertebra was fractured, but not displaced. The cord opposite the fracture for about two inches seemed somewhat deeper in colour than in any other part, from congestion. Blood existed external to the dura mater, in the arachnoid cavity, and between the pia mater and the arachnoid membranes.



In the other case, the patient, a female, aged sixty-three, had been knocked down by a carriage, the wheels of which had passed over her back. She was conveyed home in a cab, walked up-stairs, and made no complaint, but expressed a wish to go to bed. Her daughter was alarmed, when she got up in the morning, to find her frothing at the mouth and insensible. She died two hours and a half afterwards.

At the post-mortem examination blood was found on the superior and lateral aspect of the left lobe of the cerebrum and in the spinal canal. That on the surface of the brain formed a thin layer; but that in the spinal canal was considerable, particularly in the cervical region; it was situated between the pia mater and the arachnoid, forming a complete sheath around the cord, from one-twelfth to one-eighth of an inch in thickness. The right lateral ventricle contained four ounces of serum; there was a cavity at the posterior part of this ventricle capable of receiving a small chestnut. The large veins on the surface of the brain were in a state of fatty degeneration, and those on the surface of the cord were in a similar state.

Four years before she had been knocked down in crossing a street, and had remained insensible for some days. Since then her mind had been feeble, and she was liable to fall; but she was otherwise perfectly healthy.

2. *Effusion of blood into the substance of the cord.*  
When it arises from injury, or in consequence of disease

of the cord, the blood may be poured out suddenly, the patient being struck immediately with paralysis of the whole of the body below the point where the blood has escaped; or it may escape slowly, the paralysis not becoming complete for several hours. In some cases it may not take place for several days. When this occurs—a somewhat rare circumstance—the effusion seems to be preceded by softening of the cord in consequence of the injury received at the time of the accident. In the case recorded by Dr. Peddie, the effusion did not take place until eleven days after the patient had injured his back.

The following is the course the symptoms generally pursue. When the blood has escaped into the *lumbar portion of the cord*, the patients complain of sudden and often very severe pain in this region, particularly when it has been caused by injury, and of paralysis of the lower extremities, bladder and rectum. The paralysis may be sudden and complete, or developed slowly, not becoming fully formed for several hours. In the latter case it generally commences in one leg, the other becoming subsequently implicated. There is generally paralysis of both sensation and motion, very rarely of sensation alone (except at the outset), unless the quantity of blood effused is small, confined to the grey portion, and exerting no pressure on the fibrous portion. Both the urine and fæces are generally passed involuntarily at the time of the occurrence of the effusion, and sometimes an emission of semen takes place. It is common to find the penis in a state of erection, and the muscles of the

lower extremities more or less rigid and contracted, sometimes slightly convulsed. These states may exist only for a short time, or for several hours, subsiding when the blood has ceased to extend, or complete destruction of the cord ensued, or the blood made its way on to the surface of the cord. In some cases, however, they continue for several days, and seem only to subside on the occurrence of softening.

When the *dorsal portion* is the seat of the effusion, the symptoms are the same as when it is confined to the lumbar, with the exception that the muscles of the chest and, when the blood has escaped into the upper part, those of the arms, are paralysed.

CASE XXVII.—A male, aged thirty-nine, a servant in a gentleman's family, while intoxicated, fell down twelve or fourteen stone steps, on the night of the 25th December, 1849. The next morning he complained of severe pain in the back, in the vicinity of the lower dorsal vertebræ; the pain was very severe, shooting over the abdomen and down the legs. He was completely paralysed, both in sensation and motion, below the false ribs, on both sides of the body. His back was much bruised, but there was no indication of fracture of the vertebræ. He was unable to give any account as to the time the paralysis set in. He had vomited during the night, and passed both urine and fæces; the latter continued to be passed involuntarily, but the former was retained. He had priapism, and his legs were rather rigid; his pulse was quick and hard; skin hot and moist on the upper



part of the body, but that of the paralysed parts was dry; the beatings of the femoral arteries were fuller than the carotids, though of equal velocity. He was cupped and bled, and calomel and opium, with tartarized antimony, administered. On the fifth day the system became influenced by the mercury. By the sixty-first day he could move his legs slightly on the bed; but their sensation was still as obtuse as when first seen, and he had no control over the bladder or rectum. At the end of six months he could, with the aid of crutches, walk a few steps, and he had regained some command over the bladder and rectum. But he lost the power over the bladder if he allowed it to become much distended, and over the rectum if he did not evacuate its contents the moment he experienced the desire. He had gained flesh about the body, but his legs rather decreased in size. He now took strychnine and used galvanism with some benefit.

During the next six months he improved considerably, and was able to get about with the aid of crutches. He had not, three years after the accident, been able to dispense with the crutches, neither had the sensation of the parts improved, nor the power over the bladder and rectum increased.

When the *cervical portion* is the seat of the effusion, there is generally paralysis more or less pronounced of the body below the point where the blood has escaped. When the blood has been effused into the upper part of this region, death may ensue immediately, the patient



having only time to cry out that he is "dying" or "suffocated:" sometimes, however, it takes place slowly. The muscles of the face, eyelids, pharynx, and tongue, become gradually paralysed, and the respiration embarrassed, death at length ensuing either from coma or asphyxia. The occurrence of difficult deglutition, embarrassment of respiration, or coma, are always most unfavourable symptoms, and when they increase in severity are certain indicators of a fatal and generally rapid termination.

CASE XXVIII.—A male, aged fifty, entered the workhouse suffering from partial paralysis of the lower extremities, caused by chronic inflammation of the membranes of the cord.

The disease had existed about three years and a half. During the six months he was under my notice the paralysis increased in severity, evidently from the occurrence of softening of the lower part of the cord; for he gradually lost the power of controlling the escape of the contents of the rectum, and evacuating the bladder; the power of motion completely failed in the lower extremities, and, somewhat later, sensation. For several weeks before death he complained of severe pain in the back part of the head; he vomited frequently, and his face became flushed, particularly during his meals. His mind and memory continued good, and there was no loss of power or sensation in the upper extremities. His breathing, however, seemed rather more oppressed than it had been before the headache set in, and his speech rather embarrassed.

On the evening of the 10th of September, while eating his supper, he suddenly complained of an increase in the severity of the pain in the head, and of great difficulty of breathing. When seen about an hour after the attack, he was speechless, and unable to swallow, and his breathing was laboured; the lower jaw remained as it was placed, either open or closed; eyelids falling, the left more than the right—pupils contracted; pulse varied, sometimes it was 130, sometimes 140 or 150. The nurse informed me that when he was first taken the teeth were so firmly clenched that she could not introduce a spoon between them; but it ceased in the course of a quarter of an hour. The skin of the face, neck, arms, chest, and the parts of the abdomen not before paralysed, were now insensible. The muscles of the arms and neck were somewhat rigid.

About half-a-pint of blood was taken from his arm. It reduced the velocity of the pulse, rendered the breathing easier, and enabled him to swallow a few teaspoonfuls of fluid when it was conveyed into the posterior part of the mouth.

The relief was, however, only transitory; for, on returning to him after a short absence, I found him dying. Death was preceded by four or five convulsive contractions of the arms and upper part of the body, the head being drawn backward, each contraction being weaker than the preceding one. The last contraction was followed by relaxation of the muscles of the lower jaw and arms.

*Post mortem.*—The vessels of the membranes of the brain were rather distended with blood. The medulla oblongata contained an elongated clot of blood in its centre, about an inch and a half in length, broader above near the apex of the medulla oblongata than below. The nervous substance was torn up and intermixed with the clot. The medulla oblongata was congested for about an inch below where the clot existed. There was a considerable deposit of old inflammatory product in the dorsal region, and the cord was softened in the lumbar and lower part of the dorsal regions. There was ossific deposit in the arteries at the base of the brain. The ascending transverse and descending portions of the arch of the aorta presented an oblong dilatation capable of containing three-quarters of a pint of fluid. The walls of the dilatation were very thin, and contained thin plates of bony deposit.

#### TERMINATIONS AND DURATION.

1. *In apoplexy of the lumbar portion.*—When blood is effused into the substance of the cord or between the membranes, it does not always, if the quantity of blood effused is small, terminate fatally; the patient may even recover considerable power in the limbs. The latter will be more likely to occur when the blood has escaped on to the surface of the cord than into the substance.

Generally, however, chronic softening of the cord takes place. When death ensues it may take place, first, from the blood poured out increasing in quantity until



the whole of the canal becomes distended, death ensuing from general paralysis; secondly, from the occurrence of acute softening of the cord or acute inflammation of the membranes, both of which may induce a fatal termination, by extending upwards to the cervical region; thirdly, from convulsions; fourthly, from the shock.

The first mode of termination seems to be the most frequent, and death may ensue, according to the rapidity with which the blood is poured out, in from a few hours to three, four, or five days.—Secondly, from the occurrence of acute softening of the cord, or acute inflammation of its membranes: this termination is less frequently observed than the former. When they ensue (if they are extensive) death generally takes place in from seven to fourteen days.—Thirdly, from general convulsions: this seems to take place but seldom.—Fourthly, from the shock: this seems to take place very rarely.

The effused blood sometimes produces chronic softening. In this case, when it does not extend, life may be prolonged for years; the patient may even die of old age. When death ensues, it generally occurs from sloughing of the sacrum, or thighs—usually the former; or disease of the bladder and kidneys.

2. *In apoplexy of the dorsal portion.*—Apoplexy of the lower half of this region, like that of the lumbar, is not a fatal disease, and when it proves so, it is under the same circumstances. Apoplexy of the upper part is much more apt to prove fatal, from the respiration



being liable to become interfered with, in consequence of paralysis of the muscles of the chest, or from the occurrence of acute inflammation of the membranes, or of congestion or softening of the cervical portion of the cord, or from convulsions. The patients are more likely to die in apoplexy of the upper part of this region from exhaustion, sloughing of the sacrum, disease of the lungs, stomach, bowels, bladder, and kidneys, than when the lower part or the lumbar portion is the seat of the lesion.

3. *In apoplexy of the cervical portion.*—Apoplexy of this portion of the cord, whether seated in its substance or on its surface, seems generally to prove fatal, particularly when the blood is effused either on or into its upper half.

Death may take place suddenly or in a short time; this seems to be generally the case when the clot has been effused into the upper part of this region. It occurred in five out of seven cases in which the duration of life after the occurrence of the apoplexy and the changes found after death were noted.

Of eight cases of apoplexy of this region, with effusion of blood either into the substance or on the surface of the brain, in which the duration is stated:—in one, a male, aged eleven, death ensued immediately—a clot of blood, the size of a pea, was found immediately below the olivary bodies, the cord around it appeared softened; in a second, a male, aged eleven, death ensued suddenly,—in the cord opposite the atlas a clot five or six lines

long was found ; in a third, a male, aged twenty, death ensued suddenly—on the anterior aspect of the cord, immediately below the foramen magnum, there was a clot of blood, several others existed, and on the posterior aspect a clot existed opposite the fifth cervical vertebra, which extended down to the cauda equina ; in a fourth, a male, aged fifty, death ensued in two hours—blood was found in the medulla oblongata ; in a fifth, a male, aged fifty-five, death ensued in a few hours—blood was found in the posterior two-thirds of the medulla oblongata, and in the fourth ventricle ; in a sixth, a male, aged twenty-nine, in two days—the respiration did not become embarrassed until the day he died ; in a seventh, a male, aged eighty-five, death ensued in two days—several clots of blood were found on the posterior part of the medulla oblongata, and the latter when incised presented several thin strata of blood ; in an eighth, a male, aged sixty-eight, on the fifth day, opposite the fifth cervical vertebra a clot was found in the centre of the cord, the cord was broken down.

In the case of a female, aged thirty-three, suffering from caries of the body of the fourth cervical vertebra, symptoms of acute spinal meningitis of the cervical region set in, five days afterwards the respiration became embarrassed, and death ensued in three days. Blood was found between the arachnoid and pia mater, from the annular protuberance to the sixth cervical vertebra ; the fourth ventricle was distended with blood, the valve of Vieussens destroyed, and clots of blood existed at the base of the brain.

In a case observed by Sir Everard Home,<sup>1</sup> in which blood was found, after death, on the dura mater, forming a coagulum of the thickness of a five-shilling piece, and extending from the fourth cervical to the second dorsal vertebræ: the patient lived thirty-five days.

4. *In general apoplexy.*—Destruction of the whole of the cord has never been observed, but the whole of the canal has been frequently found distended with blood. The duration of life in these cases will depend upon the rapidity with which the blood is effused.

Of five cases in which the duration of life is stated when the whole canal was found distended after death: in one death ensued in a very short time; in a second, in ten hours—blood also existed on the brain in this case; in a third, in three days; in a fourth, in three days; in a fifth, in five days.

I. DIAGNOSIS OF EFFUSION OF BLOOD INTO THE SUBSTANCE OF THE CORD FROM EFFUSION OF BLOOD INTO THE CANAL.

<i>Effusion of blood into the canal.</i>	<i>Effusion of blood into the substance of the cord.</i>
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In the <i>lumbar or dorsal</i> region. The paralysis rarely takes place immediately—generally from the blood gravitating towards the lower part of the canal; it	In the <i>lumbar or dorsal</i> region. The paralysis generally takes place immediately, and is complete in all the parts below the point into which the blood has
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<sup>1</sup> Philosophical Transactions.

commences in the feet, ascending to the legs, thighs and body. It is accompanied by severe pain; but the contents of the bladder and rectum rarely escape until the paralysis reaches the trunk; the contents of the former are frequently retained.

Priapism, emission of semen, rigidity of the extremities, or convulsive agitation, never occur. Paralysis of motion is first observed, the sensation being first dull, becoming more so as the quantity of blood increases; but it is rarely completely lost unless the pressure on the cord is very great.

It is accompanied by severe pain, sudden escape of the contents of the bladder, rectum, and seminal ducts, priapism, rigidity (unless the continuity of the cord is destroyed) of the extremities, and sometimes convulsive agitations. Both paralysis of motion and sensation ensue.

The two states, viz., effusion of blood into the substance of the cord and on its surface, sometimes exist at the same time; the blood either making its way from the cord between the membranes, or rupture of a blood-vessel ensuing at both points at the same time.

When the blood has escaped into the cord or on its surface in the *cervical* region, the presence of rigidity, priapism, and the sudden escape of the contents of the bladder, rectum, or seminal ducts, would show that the blood is in the cord, and not on its surface.



II. DIAGNOSIS OF EFFUSION INTO THE CANAL, FROM ACUTE INFLAMMATION OF THE ARACHNOID, ATTENDED WITH THE RAPID EFFUSION OF SERUM.

In arachnitis, there is fever more or less pronounced; in effusion of blood, the skin is pale and cold, and the pulse weak. Acute spinal meningitis has been followed by effusion of blood. Only one case has been, however, recorded: syphilitic caries of the body of one of the cervical vertebra existed. Spinal meningitis is apt to follow on effusion of blood into the canal.

III. DIAGNOSIS OF EFFUSION OF BLOOD INTO THE CORD OR THE SPINAL CANAL, FROM CONCUSSION OF THE CORD, AND FRACTURE OF THE VERTEBRÆ WITH DEPRESSION.

Effusion of blood is very liable to be confounded with concussion or fracture with depression of the vertebræ. In concussion the paralysis takes place *immediately*; but there is neither rigidity nor any of the symptoms just enumerated as occurring when blood is effused into the substance of the cord.

Fracture of the vertebræ with depression resembles very closely apoplexy of the cord. The existence of depression or alteration in the course of the spine will at once determine the difference. Rigidity of the muscles, from the pressure on the cord being very great, or from its continuity being destroyed, is generally absent. In fracture of the vertebræ, effusion of blood either into the cord or on its surface frequently occurs.

## TREATMENT.

At the commencement of the case, to arrest the effusion of blood, bladders filled with ice may be applied to the spine, and blood taken from the arm. The system should be brought under the influence of mercury.

The induction of ptyalism as early as possible seems to be advisable, to prevent the occurrence of acute symptoms, and to favour the absorption of the effused blood.

## CHAPTER VII.

## TUMOURS.

SYN.—*Paralysis from pressure on the cord.*

THE morbid productions met with in the spinal canal are—

## I. TUBERCLES.

II. TUMOURS—*Osseous, Cystic, Hydatid, Non-malignant and Malignant.*

## I. TUBERCLES.

I. *Sex and Age.*—Males, as in most other diseases of the cord and its membranes, seem to be more liable than females; for out of twenty-six cases, twenty of the number were males.

They may occur at any period of life. Gendrin has seen them in an infant. I have twice met with them in children between three and four years of age; in both instances they were small, and co-existed with tubercles at the base of the brain and in the lungs. Generally, however, they seem to be rarely observed before the tenth year, the period in which they are most frequently found in the brain and its membranes.

From the following table of the ages and sex of twenty-four cases, it would seem that they are most frequently observed from the tenth to the twentieth year, and from the twentieth to the thirtieth year; for fourteen of the twenty-four cases occurred during these periods.

	Males.	Females.	Total.
Before the 10th year	2 (3 & 3½ yrs.)	—	2
From 10 to 20 years	4	2	6
" 20 to 30 "	7	1	8
" 30 to 40 "	1	2	3
" 40 to 50 "	—	—	—
" 50 to 60 "	1	—	1
" 60 to 70 "	2	—	2
" 70 to 80 "	1	—	1
Total.....	18	5	23

The circumstance which favours the development of tubercles in the spinal cord and its membranes is the scrofulous diathesis. Of twenty-one cases: in seventeen of the number tubercles existed in one or other of the organs, most frequently in the lungs; or scrofulous disease of the bones, generally of the vertebræ.

1. *In connection with disease of the bones.* — Delpech<sup>1</sup> has observed "that it is not rare to find tuberculous matter in the membranes when scrofulous caries of the vertebræ exist."

In four cases the bones were diseased. In one, a

<sup>1</sup> *Traité des Malad., Report. Chir., tome iii., cited by Ollivier.*



male,<sup>1</sup> aged nineteen, disease of the last dorsal vertebra and of the bones of the foot existed ; in a second, a male, aged twenty-four,<sup>2</sup> several of the dorsal vertebræ were carious, and the lungs, peritoneum, and glands were tuberculous ; in a third, a male, aged fifteen,<sup>3</sup> suffering from curvature of the spine ; in a fourth, a male, aged fourteen,<sup>4</sup> of scrofulous aspect, who had had scrofulous swelling of the knee-joint.

2. *In connection with tuberculosis.*—This was observed in thirteen cases : in three in infants ;<sup>5</sup> in a fourth, in a male, aged twelve ;<sup>6</sup> in a fifth, a male, aged twenty-four ;<sup>7</sup> in a sixth, a female ;<sup>8</sup> in a seventh, a female, aged thirty-two ; in an eighth,<sup>9</sup> a female, aged twenty-three<sup>10</sup>—the paralysis in this case set in after epidemic cholera ; in a ninth, a female, aged nineteen,<sup>11</sup> the paralysis in this case supervened on typhus fever ; in a second, a male, aged twenty-eight,<sup>12</sup>—in this case

<sup>1</sup> Lobstein : Rapport. sur les Travaux à l'Amphith. d'Anatomie de Strasbourg, 1805.

<sup>2</sup> Schlesinger : Esterich. Med. Jahrbücher, 1845.

<sup>3</sup> Fouilhoux, in Ollivier, tome ii. 760.

<sup>4</sup> Jour. de Méd. et Chir., tome xi., cited by Lallemand, sur l'Encephale, tome ii. 344.

<sup>5</sup> Myself, and Gendrin in Ollivier, ii. 761.

<sup>6</sup> Ibid.           ibid, ii. 765.

<sup>7</sup> Bayle : Recher. sur la Phthisie, obs. viii.

<sup>8</sup> Gendrin, in Ollivier, ii. 777.

<sup>9</sup> Breschet : Clin. de l'Hôpital Necker, cited in Schmidt's Jahrbücher, 1836.

<sup>10</sup> Gendrin : notes to the French edition of Abercrombie, and third edition of Abercrombie, Edin. 1834, 369.

<sup>11</sup> Duverney : cited in Schmidt's Jahrbücher, 1834.

<sup>12</sup> Auvert : Selecta Prax. Medico-Chir., tab. lxxxi.

the paralysis followed rheumatism ; in a third, a female, aged fifteen,<sup>1</sup> the paralysis set in during the existence of scrofulous disease of the eye ; in a fourth, a female, aged seventeen,<sup>2</sup> on scrofulous abscess of the hand ; in a fifth, a male, aged twenty-six,<sup>3</sup> addicted to drinking, from sleeping in an outhouse.

Of the remaining four cases : in one, the tubercles occurred in a male, aged twenty-eight,<sup>4</sup> whose health had been much reduced by intoxication and exposure ; in a second, a male, aged twenty-nine,<sup>5</sup> it followed exposure to cold ; in a third, a female, aged thirty-six,<sup>6</sup> on pleurisy ; in a fourth, a male,<sup>7</sup> epileptic since infancy, after an attack of meningitis.

#### CHANGES FOUND AFTER DEATH.

In the majority of the cases—twenty-four out of twenty-six—tubercles were found either on the cord or in its substance. They varied in size from a split pea to a filbert or walnut, and in number from one to four. Of the twenty-four cases : in seventeen, one tubercle was found ; in three, two ; in two, three ; and in two, four. When two or more existed they were generally found close together. The tubercles in the twenty-four cases

<sup>1</sup> Auvert : *Selecta Prax. Medico-Chir.*, tab. lxxix.

<sup>2</sup> Harderus : *Opera*.

<sup>3</sup> Wittfeld : *Horn's Archives*, 1827, band i. 478.

<sup>4</sup> Roderick : *Lancet*, 1839-40, vol. i.

<sup>5</sup> *Medico-Chir. Review*, 1831.

<sup>6</sup> *Liberali Giornale per servire ai progressi della Pathol.*, 1838, cited in *Arch. Gén. de Méd.*, 1838, tome iii.

<sup>7</sup> Gendrin : *Ollivier*, ii. 778.

were situated in the substance of the cord in seven of the number ; in thirteen, on its surface and in the membranes, but in no instance external to the dura mater ; in two the membranes were infiltrated with tuberculous matter ; in one the tuberculous matter was deposited under the anterior and posterior ligament.

*Position of the tubercles.*—The cervical region seems to be the part in which tubercles are most liable to occur, as will be seen from the following table of thirty cases :—

	Surface of Cord.	Substance of cord.	Total.
Cervical region.....	6	4	10
Cervical region & brain	—	—	5
Dorsal region.....	8	—	8
Lumbar region .....	2	1	3
Cauda equina.....	—	—	2
Not stated .....	—	—	2
Total.....	16	5	30

*Changes found in the cord.*—In most of the cases the cord, although it had been exposed to considerable pressure, was unaltered ; in a few it was atrophied at the point where the tubercle had passed, and sometimes softened. The softening in these cases generally arose from pressure, and not from inflammation. Of twenty cases : in thirteen it had been pressed upon, but was otherwise unaltered ; in seven it was softened, varying in extent from one to two inches, and in depth from a few lines to the whole thickness of the cord, generally

the latter: in three of these cases the tubercles were situated in the cord.

In a few cases, in which the paralysis had existed for some time, the cord and nerves below the point where the tubercle existed were more or less atrophied.

*Changes found in the membranes and ligaments.*—The membranes were rarely affected. The arachnoid cavity generally contained a considerable quantity of citron-coloured serum. In a few instances the membranes were injected or infiltrated with tuberculous matter, or sero-purulent or purulent matter, or false membranes existed.

Of six cases in which the membranes were affected: in two tubercular matter existed in the membranes; in four, pus, sero-purulent fluid, or false membranes. In one case tuberculous matter existed under the anterior and posterior ligaments.

The vertebræ were affected in four cases. In one case they were tuberculous; in a second, softened; in a third and fourth, carious; in one instance the last dorsal vertebra was affected, in the other several vertebræ.

#### SYMPTOMS.

The symptoms will vary according to the amount of pressure or irritation which the tubercles excite—their position, whether seated on or in the lower or upper part of the cord.

1. *In the lumbar region and cauda equina.*—The first symptom generally observed is pain in the spine, which is, when the tubercle is in the cauda equina or on



the cord, generally very severe, shooting over the sides of the pelvis and down the legs. In some cases the pain at the onset is confined to one leg; but as the tubercle increases in size both become affected. With the pain there is first feebleness and numbness, which gradually passes into paralysis more or less pronounced. In some cases the paralysis, like the pain, commences in one leg, the other becoming affected as the disease progresses. The sensation, particularly when the tubercle is seated on the cord, generally remains unaffected for a long time, unless the nerves of sensation or the cord are pressed upon. In the former case, the sensation may be increased; generally, however, it is diminished; and this also ensues when the cord is pressed upon, either from the occurrence of congestion, atrophy, or softening. When the tubercle is seated in the cauda equina and of some magnitude, from the pressure which it exerts both sensation and motion are generally equally affected.

In some cases, particularly when the tubercles are situated on the cord or in the cauda equina, the legs are affected with cramps, or agitations, or convulsions, or rigidity with extension or contraction. The bladder and rectum become more or less paralysed in the course of the disease.

2. *In the dorsal region.*—The pain, as in the cases in which the tubercles are seated on the cord, in the lumbar region, or in the cauda equina, is seated in the spine, whence it shoots along the nerves of the lower extremities, walls of the abdomen, and chest.

When the tubercle is seated in the upper fourth of

this region, there is generally pain in one or both arms. In some cases the pain is more pronounced in one side of the body than in the other, particularly at the commencement, sometimes throughout. The pain is accompanied by numbness and weakness of the lower extremities, and, when the tubercle is seated high in this region, with some constraint in the movements of one, sometimes of both arms.

The weakness of the extremities passes gradually into paralysis of motion; but it rarely becomes complete, unless the pressure is great or softening ensues. The bladder and rectum are invariably more or less paralysed. The sensation of the paralysed parts is rarely increased, sometimes it is diminished, and this may arise from congestion or softening, or from the pressure being great. The functions of the stomach, liver, bowels, and lungs, are frequently interfered with, and the lower extremities are sometimes affected with cramps, agitations, or rigidity, with extension or contraction. General convulsions do not seem liable to occur; for they are not stated to have been observed in any of the cases in which tubercles were found in this region.

Tubercles may exist on the cord, and not give rise to severe symptoms. It seems necessary that they should acquire a certain magnitude, and press on the cord, before paralysis is developed; and, if their growth is slow, great pressure may often be exerted before it appears.

3. *In the cervical region.*—There is generally pain, often very severe when the tubercle is on the cord and of a neuralgic character, with more or less difficulty in

moving the neck, either from stiffness or from the aggravation of pain which the attempt excites. There is generally paralysis of motion, more or less marked, of one or both arms, and weakness or paralysis of the lower extremities, and some loss of power in the muscles of the bladder and rectum.

Agitations, cramps and rigidity, sometimes affect the arms ; but convulsions of either of them or of the lower extremities rarely occur.

In only one case were the nerves given off from the upper part of the cord pressed upon. In this the tubercle was situated in the left occipital fossa, and it pressed on the fifth, seventh, eighth, and ninth nerves. The patient had difficulty in moving the tongue and speaking ; both hearing and smell were obtuse, the skin of the face insensible, and deglutition before death became impossible.

General convulsions are also extremely rare. They were observed in only one case out of six in which the tubercles were seated on the cord ; although in the cases in which they were in its substance convulsions were constantly observed, and were the most prominent symptoms.

In a case observed by Bayle, in which a tubercle of the size of a pea was found in the left half of the medulla oblongata, a little above the pyramidal and olivary bodies, the patient, who was dying from phthisis, was taken three days before death with twitchings of the tendons of the wrists, flexion of the forearm, hands and fingers, particularly of the right, in which motion was somewhat difficult, but sensation was preserved. Before



death, the right arm was nearly paralysed. He had partial convulsions of the muscles of the face, and involuntary escape of the contents of the bladder and rectum.

In a second case, observed by Gendrin, in which two tubercles of the size of nuts were found in the centre of the medulla oblongata, the patient, a male, aged sixty, had been subject to accesses of epilepsy once a fortnight for twelve years. The access commenced with violent hiccough, which lasted from one to two minutes, accompanied by a sensation as if a ball were rising from the stomach to the pharynx, followed by loss of sensation, which lasted two or three minutes, when the attack ceased. In another case observed by the same author, in which a tubercle of the size of a nut was found, the patient had had for five years, at each menstrual period, an access, which commenced with a sensation as of a ball rising in the throat, inducing a feeling of suffocation and a horror of liquids, followed by insensibility. The access lasted about an hour.

In another case, in which an elongated tubercle was found in the centre of the cord between the fifth and seventh cervical vertebræ, with softening of the cord, the patient had been epileptic since his youth. During the access the extremities were violently convulsed, and at the same time there was constriction in the præcordial region, which was soon followed by fainting. To these followed palpitation of the heart for a quarter of an hour, when he recovered. In 1817 he had an attack of meningitis, which yielded to treatment. He became after this gradually paralysed in the right side, and his



mind failed. Death ensued in 1818, after an access of delirium of twenty-four hours' duration. The left optic thalamus was softened.

4. *In the cervical region and brain.*—In neither of the cases observed by myself had the tubercles on the cord excited any symptoms during life.

Of the three remaining cases: in one, the patient, a scrofulous male, aged fourteen,<sup>1</sup> was taken, after suffering for two months from severe and constant pain in the head, with convulsions, after which he sank into a state of coma, and died. There was a tubercle of the size of a nut on the posterior part of the medulla oblongata, and one in the left lobe of the cerebellum. A large quantity of fluid was found in the ventricles and in the spinal canal.

In the second case, observed by Piaud,<sup>2</sup> the patient, a male, aged twenty-four, had suffered for three or four months from severe pain in the back of the head. He was relieved by treatment, but soon relapsed.

On the 4th June the pain was very intense; he had loss of appetite, nausea, vomiting, and obstinate constipation.

*July 15th.*—Extremities feeble.

*24th.*—Weight in the eyes, and feebleness of sight; pupils large and motionless.

In August, difficulty in moving the tongue and in speaking; sight very feeble; deglutition difficult, at last it became impossible; loss of power in upper extremities and weakness of the lower; hearing difficult; taste and

<sup>1</sup> Cited by Lallemand.

<sup>2</sup> Ephemerides, 1826: Edin. Med. Jour., 1827.

smell obtuse, and the skin of face insensible. Death ensued on the 2nd of December.

The lateral ventricles were greatly distended with clear serum; the commissure of the optic nerves thick and flaccid; a tumour of the size of a hen's egg existed in the left occipital fossa—it compressed the posterior face of the medulla oblongata, the fifth, seventh, and eighth nerves, and even the ninth.

In a third case, observed by Harderus, in which, towards the termination of the cerebellum three globular tumours were found, one of which, of the size of a nutmeg, pressed on the commencement of the medulla oblongata. The patient, a female, aged seventeen, was seized, on the 3rd of November, with severe lancinating pains in the head, followed by convulsions, which were succeeded by somnolency and stupor of the left side. She was somewhat relieved by treatment. Later fever set in, with great oppression about the præcordium, difficulty of breathing, insensibility, and convulsions, followed by death.

## II. OSSEOUS TUMOURS.

Of eight cases which I have collected from different sources or observed, all belonged to the male sex. Their ages were nine, twenty, twenty-three, thirty, forty, forty-four, forty-eight, and fifty years.

In three of the cases the odontoid process of the second cervical vertebra was enlarged.<sup>1</sup>

<sup>1</sup> Bright: Reports of Medical Cases, case cxlvii.; Froriep, Neue Notizen, 1839; and Reid, Edin. Monthly Jour, 1843.

In two cases the ossification occurred in the dorsal vertebræ. In one,<sup>1</sup> the intervertebral substance above the twelfth dorsal vertebra, with the ligament covering it, presented an ossified ridge; in the second,<sup>2</sup> a small tumour sprang from the second dorsal vertebra.

In three cases the lumbar vertebræ were the seat of the disease. In one,<sup>3</sup> it occurred as an irregular enlargement of the upper edge of the first lumbar vertebra; in the second,<sup>4</sup> the lumbar vertebræ were covered with irregular bony prominences, and the intervertebral substance between the second and third projected more than usual. Portal<sup>5</sup> has seen the two first lumbar vertebræ and the last dorsal covered with bony prominences, narrowing the canal one-half.

In some of the cases the cord was softened; in others it had undergone apparently no compression; while in others it was atrophied, and sometimes softened at the point where the pressure had been made.

#### CAUSES.

Rheumatism and syphilis seem occasionally to induce ossification of the vertebræ. In three cases the patients had suffered from the former disease. In the case observed by Mr. Hutchinson it had been acute; in Dr. Reid's case the patient had been under treatment seven months before for rheumatism; and in the one observed

<sup>1</sup> Aston Key: *Medico-Chir. Transact.*, 1838.

<sup>2</sup> Hutchinson: *Lancet*, 1838-9, vol. ii.

<sup>3</sup> Myself.    <sup>4</sup> Aston Key.    <sup>5</sup> Cited by Ollivier.



by myself the patient had had chronic rheumatism for several years.

In one of the cases observed by Mr. Key it was attributed to fatigue; in the second, the patient had suffered for some years from stricture of the urethra—he had also perineal fistula; the paralysis supervened on fever accompanied by delirium. After death an abscess was found in the psoas muscle, a fæcal collection in the abdomen, and suppurating points in the kidneys.

In two cases the patients had had syphilis. In one, a male, aged thirty,<sup>1</sup> after suffering from slow fever for several months, accompanied by a pustular eruption which degenerated into deep sores, paraplegia gradually established itself; the second, a male, aged forty,<sup>2</sup> had had chancre; at the time he was suffering from paraplegia he had also exostosis of the clavicle. The existence of the latter led Dr. Prus to suspect that the cause of the paralysis was exostosis of the vertebræ.

#### SYMPTOMS OF OSSEOUS TUMOURS.

These do not differ from those generally observed in other tumours in the spinal canal.

Of the cases in which the *odontoid processes* were enlarged: in one, a male, aged nine, observed by Froriep, the patient had choreic symptoms; in the second case, a male, aged twenty, observed by Dr. Bright, the

<sup>1</sup> Houstet: Mem. de l'Acad. de Chirurgie, tome iv. 141.

<sup>2</sup> Prus: Revue Médicale, 1840, tome iv.



patient's head was bent forward so that the chin rested on the sternum ; he had complete hemiplegia of the right side, with pains which the patient considered rheumatic ; he had pain in the neck, tenderness on pressure, and slight irregularity of the spinous process. In the third case, observed by Dr. Reid, the patient's head was drawn towards the right shoulder ; he had pain in the back of the head, most pronounced towards the right side ; pains in both arms, from the shoulders to the elbows ; numbness and stiffness of the forearms and hands ; pain in the back and down the posterior part of the thighs.

In the cases in which the disease was seated in the dorsal region. In one case the patient, a male, aged twenty-three, observed by Mr. Hutchinson, had had three months before his admission acute rheumatism. When admitted he complained of pains in the loins, right hip, and leg ; in the last, there were occasionally cramps and spasms. One month after admission, loss of power in both ankles ; fifteen days later diminished sensation of both legs, with slight spasms, which were followed in a few days by increased sensibility ; this continued, but the paralysis of motion became complete. In the second case, observed by Mr. Key, the patient, a male, aged forty-four, was taken after excessive walking with weakness of the left knee, which soon extended to the foot, accompanied by numbness and a sensation of cold ; the right leg became affected in the course of a week or two. At the end of ten months he began to lose power over

the sphincter ani, and at the end of a month he had lost nearly all control over it. One month later, when seen, nearly complete paralysis of motion existed in the lower extremities, particularly in the left, with numbness, pain, and tingling, extending from the loins down to the feet; inability to empty the bladder save by drops, and imperfect command over the rectum.

In the cases in which the disease was seated in the lumbar region. In one case, observed by Mr. Key, the patient, a male, aged forty-eight, was under treatment for stricture of the urethra and perineal fistula, when he was taken with delirium and fever, his extremities being extremely cold. The fever subsided under treatment, but paralysis of the right leg existed. The fever and delirium returned, accompanied by diminished secretion of urine, and severe pain across the upper part of the abdomen, extending into the loins, particularly the left. The left leg became subsequently paralysed. An abscess was found on the psoas muscle, which communicated with the hip-joint; the colon was ulcerated, and over the right kidney there was a peritoneal cell communicating with the colon, and containing faecal matter; in one of the kidneys there were two or three suppurating points.

In the case observed by myself, the patient, a male, aged forty-four, had suffered for years from lumbago. The paralysis had existed for eighteen months. It had been gradually established, and had been preceded and accompanied for some time by severe pains in the lower extremities. Paralysis of motion first set in, then the

sensation became affected. When seen, there was complete paralysis of the lower extremities, and also of the bladder and rectum.

#### DURATION AND TERMINATION.

Of the three cases in which exostosis of the *odontoid process* existed. In one observed by Froriep, death ensued from apoplexy, about a year after the choreic symptoms appeared. In the second, observed by Dr. Bright, from erysipelas, about seven months from the first appearance of the symptoms; and in the third, observed by Dr. Reid, from typhus fever, about three months after the occurrence of symptoms referable to the cord; he had previously suffered from pains, which were considered to be rheumatic, for seven months.

Of the two cases in which the exostosis was seated in the *dorsal region*. In one case, observed by Mr. Hutchinson, the patient died three months after his admission into the hospital, in a state of great debility. In the second, observed by Mr. Key, death ensued from sloughing of the nates, about twelve months from the commencement of the symptoms.

In the two cases in which the disease was seated in the *lumbar region*. In one, observed by Mr. Key, the patient died in the course of six or seven weeks from abscess in the psoas muscle and hip-joint, and faecal collection in the abdomen. In the second case, observed by myself, the patient died from disease of the bladder and kidneys, twenty-one months from the commencement of the paralysis.

In the two cases observed by Houstet and Prus, the patients, who were suffering from syphilitic exostosis of the vertebræ, recovered under the use of anti-syphilitic remedies.

### III. NON-MALIGNANT AND CYSTIC TUMOURS.

Albers<sup>1</sup> found a *fatty tumour* external to the dura mater in an old man who died from pneumonia.

Lowenhard<sup>2</sup> met with a *sarcomatose* one in the spinal canal.

Dr. Fisher<sup>3</sup> found a lobulated tumour in the cauda equina of a patient. It had followed injury of the loins.

Dr. Gull<sup>4</sup> has published three cases in which tumours were found. In one case, a vascular tumour of the size of a hazel-nut existed. Under the microscope free nuclei and nucleated cells were discovered, contained in an albuminous blastema. He did not consider it to be cancerous. In the second case, the tumour consisted mostly of cohering nuclei, generally oval. In the third case, the tumour was oval and vascular; it consisted of a soft yellow substance, easily broken up, containing numerous cellular spaces.

*Cystic Tumours.*—Portal<sup>5</sup> has met with cysts on the cord, but he does not state what they contained.

<sup>1</sup> Anat. Pathologisch, tab. xxiv. fig. 1.

<sup>2</sup> Diss. de Myeloplithisi, Berlin, 1817, cited by Otto.

<sup>3</sup> Provincial Medical Association Transactions, 1842.

<sup>4</sup> Guy's Hospital Reports, 1856.

<sup>5</sup> Anatomie Médicale, tome iv.



Lobstein<sup>1</sup> found a large one, containing a substance like plaster. Mr. Roderick,<sup>2</sup> a large one filled with thick gelatinous fluid; and Dr. Ogle<sup>3</sup> one of the size of a pea—it appeared to be congenital.

Dr. Risdon Bennett<sup>4</sup> met with one with walls one line and a half thick, containing blood corpuscles of the size and colour of healthy ones; but they resembled starfish, sending off from three or four to five or six or seven radii. Crystals of triple phosphate were discovered in the lining membrane. Dr. Barkhow,<sup>5</sup> of Breslaw, found cysts in a child born with spina bifida.

#### IV. HYDATIDS.

Hydatids are very rarely observed; for I have not been able to collect more than six cases. Five of the patients were females, and their ages were twenty-two, twenty-five, twenty-six, twenty-nine, and fifty-six years; the sixth was an infant, in whom they were congenital.

In three of the six cases the hydatids were seated in the spinal canal; in two instances they formed swellings on the spine. In the remaining three cases they had made their way between the vertebræ on to the dura mater, from tumours seated at the side of the vertebral column.

In one of the two cases in which the hydatids were developed in the spinal canal, the patient, a female, aged fifty-six, had suffered since her fifty-third year, in

<sup>1</sup> Rapport, Strasbourg, 1805.

<sup>2</sup> Lancet, 1839-40, vol. i.

<sup>3</sup> Lancet, 1855.

<sup>4</sup> Pathological Transactions, 1848-9.

<sup>5</sup> Dis. Circa, Monst. duo Humano. Spina Bifida Affect., Vratislav, 1842.

consequence of fright from epilepsy;<sup>1</sup> she fell, after an access, into a state of coma, and died. The hydatids extended from the medulla oblongata down to the lumbar portion. The pituitary gland contained a cyst filled with reddish-brown fluid. In the second, the child<sup>2</sup> was born with two swellings in the lower part of the spine. It did well for some weeks, when it became convulsed, and died with hydrocephalic symptoms. Its mother was scrofulous, and she had lost two children from hydrocephalus.

In the third case, the patient, a female, aged twenty-five, first complained of a painful sensation of cold for five or six months along the spine. The pain became suddenly fixed in the lumbar region—the lower extremities insensible; but she continued able to walk, and had retention of urine and fæces. The pain increased in severity and extended to the right thigh, the whole posterior part of which, to the popliteal space, and also the heel, became paralysed. Some time afterwards a collection formed below the kidneys, which opened spontaneously, and a large quantity of serous fluid escaped; the opening closed immediately. There also existed a swelling at the lower part of the lumbar region, which, when pressed upon, aggravated the pain in the right thigh, and, when percussed, excited a sensation as if fluid ascended along the spine. Various measures were employed without relief. At length the tumour was

<sup>1</sup> Esquirol : *Bul. de la Faculté de Méd.*, tome v.

<sup>2</sup> *Quadrat Oestreich Wochenschrift*, 1841.

opened and a large quantity of hydatids escaped. By introducing the finger, the vertebral canal was found to be opened, and the spinal cord laid bare. For several days hydatids escaped; but no serious symptoms were developed. The case was published by M. Reydellet<sup>1</sup> in 1819; she afterwards fell under the notice of M. Foulhoux:<sup>2</sup> her health was good, but she was completely paraplegic. She died in 1820.

Of the three cases in which the hydatids had made their way into the spinal canal. In one, the patient, a female, aged twenty-two,<sup>3</sup> was nine months advanced in in her second pregnancy. She had complained for six months of dull pain in the upper part of the back, and for some weeks the lower extremities had been paralysed both in sensation and motion. She was delivered on the 4th of June; her labour was easy. Fever set in on the 8th, sloughs formed on the sacrum, and she died on the 13th.

The right lung formed part of a cyst, which was situated close to the spine; the third and fourth vertebrae, and the extremity of the corresponding ribs, were eroded, and the right lateral foramen of the fourth dorsal vertebra was capable of admitting the extremity of the finger. The cyst contained a number of hydatids, and a dozen of various sizes existed in the spinal canal; they extended as high as the second dorsal vertebra, where they formed a ring which constricted the cord: the cord was unaltered.

<sup>1</sup> Dict. des Sciences Medicales, art. Moel Epinière.

<sup>2</sup> Ollivier.

<sup>3</sup> Chaussier: Jour. de Méd., 1807.



In a second case, the patient, a female, aged twenty-six,<sup>1</sup> was taken, ten months after her confinement, with pain in the left lumbar region, which gradually increased in severity and extent; the pain was lancinating, beating, and gnawing. At the end of seven months she began to suffer from cramps or a kind of stupor in the lower extremities; this existed for some time, when the power of motion and sensation diminished sensibly, and were soon completely destroyed; and with these the bladder and rectum became paralysed. At length slow fever set in, with sloughing of the sacrum, and death ensued nine months from the commencement of the symptoms.

A cyst of the size of the fist, containing hydatids, was found under the peritoneum, near the left kidney, which it had, with the diaphragm, displaced. It adhered intimately to the bodies of the first and second lumbar vertebræ, its base being situated between these two vertebræ, and formed by the periosteum, which was eroded. The intervertebral foramen through which the lumbar nerve passed was large enough to admit the extremity of the thumb. The hydatids had penetrated through this opening, from the cyst into the spinal canal; they were of various sizes, surrounding the membranes on all sides, and compressing the lumbar nerves.

In the third case, the patient, a female, aged twenty-nine,<sup>2</sup> had began five years before to suffer from pain in the back and loins, at first slight, but it increased in

<sup>1</sup> Chaussier : Morgagni, Nova Edit. tom. v. 168, Lutetiae, 1822.

<sup>2</sup> Mélier : Jour. Gén. de Méd., 1825.



severity, and at length the movements of the body became interfered with. The pains at length extended to the lower extremities, and their movements became difficult. Suddenly the pains became very intense, passing from the dorsal and lumbar regions down both legs. The legs were in a tetanic state, and agitated at times. She could, in the intervals of the pains, move the legs slightly. She also experienced pains in the walls of the chest, but they were not intense; respiration was difficult, with fever, which increased towards night. The legs at length became completely paralysed, both in motion and sensation, but the pains continued quite as severe. Death at length ensued from diarrhœa and sloughing of the sacrum.

An hydatid cyst was found, containing twenty hydatids, varying in size from a shot to a filbert, close to the middle of the dorsal portion of the spine. The laminæ of the vertebræ were eroded, and an aperture three lines in diameter existed between the fifth and sixth, through which the cyst communicated with the spinal canal. The latter contained, between the dura mater and the fifth, sixth, and seventh dorsal vertebræ, hydatids enveloped in a delicate cyst. The hydatids had pressed on the cord, which was sensibly atrophied, and eroded the vertebræ.

#### V. CANCEROUS TUMOURS.

*Age and Sex.*—Males seem to be more liable to malignant disease of the spinal canal than females; for,

out of twenty-six cases which I have collected and observed, fifteen of the number belonged to this sex.

It does not seem to be entirely confined to the middle and later periods of life, for it has been observed as early as the seventh year. The liability is, however, as in cancer of other organs, most pronounced from the thirty-fifth to the seventieth year; for fifteen out of twenty-four cases in which the ages and sex were stated occurred to patients between these ages.

The following table will show the ages and sex of twenty-four cases:—

	Males.	Females.	Total.
From 5 to 10 years	1 (æt. 7)	—	1
" 10 to 15 "	4	—	4
" 15 to 20 "	—	1	1
" 20 to 25 "	2	—	2
" 25 to 30 "	1	—	1
" 30 to 35 "	—	—	—
" 35 to 40 "	1	1	2
" 40 to 45 "	1	1	2
" 45 to 50 "	2	—	2
" 50 to 55 "	—	2	2
" 55 to 60 "	1	2	3
" 60 to 70 "	2	2	4
	15	9	24

In some cases the cord or the membranes—generally the latter—became implicated, in consequence of cancer existing in adjacent organs, as the brain, œsophagus, stomach and pancreas, prostate gland, &c.; or from cancer of the vertebræ, or cancerous tumours in the immediate vicinity of the spine. The implication of the cord or its

membranes, or cancerous formations within the canal, occurred, either from the disease passing between the vertebræ into the canal, implication of the vertebræ, or secondary deposits.

Of six cases in which the cancer had either made its way into the spinal canal between the vertebræ, or formed there from secondary implication: in one, the patient, a female,<sup>1</sup> was suffering from cancerous ulceration of the side of the neck and cancerous infiltration of the cellular tissue of the neck; the cancer had made its way into the spinal canal, the cellular tissue between the dura mater and the vertebræ being infiltrated.

Of seven cases in which tumours existed in the membranes or on the inner surface of the vertebræ, or where the latter were converted into cancerous tissue and pressed on the cord: in one, the patient, a female, aged fifty-five,<sup>2</sup> was taken, six years after her breast had been removed for cancer, with pain in the back, followed by paralysis; the cicatrix and glands of the axilla were cancerous, and cancer existed in the chest and abdomen; in a second, a male, aged forty-six, cancer of the posterior part of the stomach and pancreas existed; in a third, a male, aged forty,<sup>4</sup> cancer of the posterior part of the œsophagus; in a fourth, a male, aged sixty,<sup>5</sup> cancer of the prostate gland; in a fifth, a female, aged eighteen,<sup>6</sup> a cancerous tumour close to the spine; in a sixth, a

<sup>1</sup> Ollivier.      <sup>2</sup> Hawkins: *Medico-Chir. Transact.*, 1841.  
Myself.      <sup>4</sup> *Ibid.*

<sup>5</sup> Thompson: *Pathological Transact.*, vol. v., 1848-9.  
Aston Key: *ibid.*



male, aged twenty-six,<sup>1</sup> the seventh cervical vertebra was converted into a cancerous tumour—the fourth and fifth dorsal were also affected; in a seventh, a female, aged sixty-four,<sup>2</sup> the first lumbar vertebra.

In five cases the cancer was excited by injury. In one case, a female, aged sixty,<sup>3</sup> from being knocked down—in this case the tumour was situated in the spinal canal; in a second, a male, aged fourteen,<sup>4</sup> from falling, the back striking against a chair—in this case the tumour also existed in the canal, but it had made its way outwards on each side between the vertebræ; in a third, a male, aged fourteen,<sup>5</sup> from falling from a window, two encephaloid tumours formed on the lower part of the spine, the cord was replaced by encephaloid tissue; in a fourth, a male, aged ten,<sup>6</sup> after a fall on the back—in this case two tumours appeared, one in the upper part of the back, and one in the lumbar region; in a fifth, a male,<sup>7</sup> a cancerous tumour had formed from a blow on the back, destroyed the four last dorsal vertebræ, and affected the sheath of the cord.

In two cases the cancer occurred in connection with cancer in the brain. In one case, a male, aged eleven,<sup>8</sup> a cancerous tumour existed in the centre of the cerebellum, the posterior part of the whole length of the cord

<sup>1</sup> Cruveilhier, *Anat. Pathologique*, 1 livraison.

<sup>2</sup> *Ibid.*, 32<sup>e</sup> livr.

<sup>3</sup> *Ibid.*, 32<sup>e</sup> livr.

<sup>4</sup> *London Medical Obs. and Inquiries*, vol. iii.

<sup>5</sup> Phillips: *New London Med. Journal*, 1792.

<sup>6</sup> Wolf: *Gazette Medico-Chir.*, Inspruck, 1825, in Ollivier.

<sup>7</sup> Lecat: *Traité des Nerfs*, Berlin, 1765.

<sup>8</sup> Guersent fils: Ollivier, tome ii. 752.



was covered by a layer of encephaloid matter; in a second, a male, aged seven,<sup>1</sup> the tumour existed at the posterior and lower part of the cerebellum, the restiform and olivary bodies were converted into encephaloid matter.

In a case observed by Collin,<sup>2</sup> with the tumour in the canal there was a band of firm white substance, from one and a half to two inches in length, on each lobe of the cerebellum.

In two cases the disease followed convulsions. In one, the patient, a female, aged thirty-six,<sup>3</sup> had had, when twenty-seven years of age, a nervous disease, and when thirty-four a convulsive affection; the disease appeared soon afterwards. In a second, a female, aged fifty-two,<sup>4</sup> from fright, was seized with convulsions and insensibility; when she recovered the lower extremities were paralysed.

In one case the patient, a male, aged twenty-one,<sup>5</sup> was taken with paralysis when convalescent from peritonitis.

#### CHANGES FOUND AFTER DEATH.

In the majority of the cases ovoid or flattened tumours were found, varying in size from a small nut to a pigeon's egg. They were almost invariably situated

<sup>1</sup> Guersent : Velpeau, Arch. Gén. de Méd., 1823.

<sup>2</sup> Revue Médicale, 1824, cited by Ollivier.

<sup>3</sup> Cruveilhier, 32<sup>e</sup>. livr.

<sup>4</sup> Serres : Jour. de Majendie, 1828.

<sup>5</sup> Velpeau : Arch. Gén. de Méd., 1825.

internal to the dura mater, generally in the sub-arachnoid tissue, adhering to or implicating the pia mater or arachnoid, and occasionally the dura mater. In none of the cases were tumours found in the cord.

Of ten cases: in six of the number the tumours were confined to the spinal canal; the membranes, cord, and vertebræ being unaffected.

Of four other cases: in one the tumour had made its way outwards between the vertebræ; in a second,<sup>1</sup> it had caused considerable absorption of the pedicle, lamina, and transverse process of the right side of the sixth cervical vertebra; the cord was much twisted, so that the right lateral surface had almost a posterior aspect; in a third and fourth case, the cellular tissue between the dura mater and the vertebræ was infiltrated with encephaloid matter.

In nine cases the tumours either sprang from the vertebræ, or they were formed by the vertebræ, which either pressed on the cord, or involved it in the cancerous alteration. In three of the cases the tumours sprang from the vertebræ; in five, the vertebræ were affected. In six of these cases neither the cord nor its membranes had undergone any alteration. Of the three remaining cases: in one, in which the spinous processes of the four last dorsal vertebræ were affected, the sheath of the cord was implicated; in the second, in which the last dorsal and the two first lumbar vertebræ were affected, the membranes were destroyed and the cord implicated for two or three inches; in a third, in which the spine from

<sup>1</sup> Ogle: *Pathol. Transact.*, 1855-6.

the third dorsal vertebra downwards was affected, both the membranes and cord were implicated.

*Position of the disease.*—The dorsal portion of the spine is the part most liable to cancer; for it was the seat of the disease, alone or in connection with either the cervical or the lumbar portion (as will be seen from the following table), in fifteen out of twenty-three cases:—

In two cases the cauda equina was the seat of cancer.

In one case the lumbar portion.

In two cases the lumbar and dorsal.

In ten cases the dorsal.

In three cases the dorsal and cervical.

In three cases the cervical.

In two cases the cervical and brain.

*Implication of the membranes.*—The dura mater seems to be the only membrane liable to primary cancer.

This takes place but seldom; for it was affected in only two out of twenty-three cases. When the vertebræ are extensively affected, all the membranes are generally implicated, the cord being sometimes softened either from pressure or inflammation, or in a state of cancerous degeneration.

*Implication of the cord.*—I am not acquainted with an instance in which the cord was the seat of *primary* cancer.

It is rarely implicated *secondarily*, unless the vertebræ and the membranes are extensively affected. In two out of four cases in which it was affected, the vertebræ were extensively diseased, and it was replaced by cancer-



ous tissue. In the two remaining cases: in one encephaloid masses existed at the base of the cerebellum; they had descended into the spinal canal, and had caused the olivary and restiform bodies to be converted into encephaloid tissue; in the second, an encephaloid tumour existed in the cerebellum, and there was a layer of encephaloid matter on the posterior part of the cord.

The cord was occasionally affected with softening in the immediate vicinity of the tumour, generally from the effects of the pressure, rarely from inflammatory action.

*Implication of other organs.*—There seems to be, in cancer of the spinal canal, as in cancerous formations within the skull, a much less tendency to cancer in other organs than when the viscera or the surface of the body is affected.

Out of twenty-three cases, in nine cancer existed in other parts of the body.

Of six of these cases, the cancer existed in five, in organs or parts in immediate contact with the spine; in the remaining case, the prostrate gland was cancerous, and the adjacent glands in a state of cancerous degeneration.

Of the three remaining cases cancerous formations existed in the brain; in two of these cases the cancer in the canal was secondary, but in the third both were primarily affected, a cancerous tumour existing in both.

#### GENERAL SYMPTOMS OF CANCEROUS FORMATIONS IN THE SPINAL CANAL.

The symptoms will vary according to the amount of pressure and irritation which the growths produce.



When they only press on the cord, the chief symptoms will be pain in the spine, more or less intense, with paralysis of motion, sensation often remaining intact for a considerable period, sometimes throughout, if they do not press severely on the cord and interfere with the reception of impressions or excite congestion or softening. When the tumour is seated in the cauda equina both motion and sensation are equally affected.

When, however, they excite irritation, there will be, in addition to the pain in the spine, which is generally very severe, and the paralysis of motion, agitations or convulsions of the extremities, sometimes rigidity, either with extension or retraction.

The paralysis of motion generally sets in rapidly. In some cases it commences in one side of the body, the opposite side remaining intact, or less affected for a short time, until the tumour increases in size, and presses equally on both sides of the cord. In some instances the paralysis is preceded by severe pains of a lancinating or numblike character passing from the spine along the nerves; in others by agitations or convulsive motions of the extremities. The cutaneous sensibility is rarely increased. It was only observed in two cases. In one recorded by Serres, in which the dura mater from the fifth cervical to the third dorsal vertebra was fungoid, the bodies of the vertebrae white and slightly softened, the anterior ligament destroyed, and the cord opposite the seventh cervical and the three first dorsal vertebrae softened. The patient, when convalescent from peritonitis, was seized with paralysis of motion, the sensa-

tion becoming more and more acute as it increased, causing him to utter loud cries when touched.

In the second case, observed by Velpeau, in which a tumour was found on the anterior part of the cord, extending from the sixth cervical vertebra to the third dorsal, and which had caused destruction of the anterior left roots of the nerves, partial destruction of the right roots, only filaments remaining, and alteration of the posterior left roots, the patient was taken, after a convulsive affection, with pain in the left arm, followed by pain in the head. One month before her admission into the hospital, the pain in the arm increased, and paralysis of motion gradually set in; convulsions again appeared, the lower extremities being also affected; they were followed by complete paralysis.

On admission, she did not suffer severely; she could not move the left arm, yet its sensibility was but little altered; motion of the right arm was difficult, and both it and the left were the seat of severe pains. Gradually the power of motion was destroyed in the right arm; but its sensibility became at length so much increased that when it was pinched she uttered loud cries; in the left arm the sensation diminished and became quite indistinct.

In tracing the symptoms which exist when the tumours occur in different parts of the cord:—

1st. When in the *cauda equina*, both paralysis of motion and sensation exist, occasionally more pronounced in one leg than in the other, and paralysis of the bladder and rectum, with pain in the spine, shooting down the

legs and over the walls of the pelvis. In some cases the lower extremities are affected with agitations or convulsions, and they are generally more or less rigid and sometimes contracted.

2ndly. When in the *lumbar or dorsal region*, pain, more or less severe, exists in the spine, passing along the nerves of one or both legs, walls of the abdomen, chest, and, when seated in the upper part of the dorsal region, down the arms, with paralysis of motion. The latter in some cases, from the tumour being seated on one side of the cord, is more pronounced in one leg than in the other ; but this, from the tumour increasing rapidly in size, is seldom of long duration. The sensation frequently remains unaffected for a considerable period, sometimes throughout.

Paralysis of the bladder and rectum, more or less pronounced, exists, and more or less disorder of the functions of the bowels, liver, stomach, and, when situated on the upper part of the dorsal region, of those of the lungs.

In some cases the extremities are affected with agitations, or convulsions, or rigidity with extension or retraction.

General convulsions rarely occur ; they were only observed in two cases—in one, reported by Mr. Key, the patient died in the first access ; and in another, recorded by Velpeau. In this case two attacks of convulsions occurred ; one before any symptoms of disease of the cord appeared ; the other before the paralysis.

3rdly. When in the *cervical region*, there is pain



generally of a very severe character shooting down the arms, sides of the chest, neck, and back, and sometimes in the face; weakness or paralysis of the body below the seat of the pain. In some cases agitations or convulsions of the arms, body, or lower extremities exist. The breathing is generally interfered with; there is often convulsive cough—hiccough and disordered digestion, and occasionally difficult deglutition or alteration of the voice, paralysis of the tongue or of the muscles of the face. General convulsions are more liable to occur when the tumour is seated in this region than in the dorsal.

In the cases in which the cervical region and the brain were the seat of cancer, the symptoms present were those of disease of the brain. This seemed to be due to the cancer commencing first within the skull, and masking the symptoms of disease within the spinal canal. In one case, observed by Guersent, although the cancerous tumour, which was situated at the posterior and inferior part of the cerebellum, descended into the spinal canal, and compressed the cord above and posteriorly, and converted the restiform and olivary bodies into encephaloid matter, there was no paralysis of the lower extremities.

#### DURATION AND TERMINATION.

The *termination* is invariably fatal, and death seems generally to ensue from debility and emaciation. This was the termination in eleven out of twenty cases; in the remaining nine cases, death ensued in four from disease of the brain, in two of these, tumours existed in



the skull; in the remaining five it occurred from general convulsions, sloughing of the sacrum, disease of the lungs, or purulent formations in the joints.

The duration of the disease varied considerably. Generally, as in cancer of other organs, the disease was more rapid in its progress in the young than in those advanced in years, and when the cancer in the canal was secondary; death in the latter cases generally ensued from disease of some other organ, or from the debility and emaciation which existed before the cancer appeared on the cord.

The following will show the duration and termination in fifteen cases, and the termination in twenty-one, with the complications.

Of the fifteen cases: in one, a female, aged eighteen, death ensued, four days after the occurrence of the paralysis, from convulsions—a cancerous tumour existed in the canal and on the fourth and fifth dorsal vertebræ, and cancerous tubercles on the lungs; in a second, a male, aged forty, from vomiting and diarrhœa, four weeks after the paralysis set in—cancer of the œsophagus and adjacent parts existed in this case; in a third, a male, aged forty-six, nine weeks after the paralysis occurred, from exhaustion; in a fourth, a male, aged fourteen, death ensued in three months—the tumour was situated in the upper part of the dorsal region, and had made its way between the vertebræ outwards; in a fifth, a male, aged sixty, death ensued about four months after the paralysis occurred in a state of extreme emaciation—the prostrate gland was cancerous, the adjacent glands infiltrated, and the pelvis of the kidneys contained pus; in a sixth, a

male, aged twenty-seven, death ensued at the end of four months from exhaustion—the seventh cervical vertebra and the fourth and fifth dorsal were cancerous ; in a seventh, a male, aged eleven years and a half, death ensued six months after the occurrence of headache from cerebral symptoms—a tumour was found in the centre of the cerebellum, and a layer of encephaloid matter the whole length of the posterior part of the cord ; in an eighth, a male, aged forty-five, death ensued from exhaustion at the end of six months—the last dorsal vertebra and the two first lumbar, and the cord for two inches, were cancerous ; in a ninth, a female, aged fifty-five, death ensued in about eight months—a cancerous tumour existed opposite the sixth dorsal vertebra, with cancer in the abdomen, peritoneum, pleura, and of the cicatrix of the breast and axillary glands ; in a tenth, a male, aged twenty, death ensued from cerebral meningitis, at the end of twelve months—the dura mater from the fifth cervical to the third dorsal vertebra was fungoid, the body of the third dorsal vertebra altered, and the cord from opposite the seventh cervical vertebra to the third dorsal softened. In five cases, in which tumours were found in the canal, death ensued in two, at the end of two years, from exhaustion—both were females, and their ages were respectively thirty-six and fifty-two years ; in a third, a female, aged fifty-two, at the end of three years, from purulent collections in the joints : in a fourth, a female, aged fifty-two, at the end of three years, from asphyxia—the cord in this case was softened ; in a fifth, a female, aged sixty, at the end of four years, from sloughing

of the back. In all these cases no secondary formations seem to have existed in any other part of the body.

Of six other cases in which the duration of the disease cannot be determined, death ensued in one, a male, aged sixty-three, from cerebral hæmorrhage—a tumour existed in the cauda equina in this case; in a second, a male, aged fourteen, from debility and ulceration of two encephaloid tumours on the lower part of the spine; in a third, a male, from exhaustion consequent on the large escape of fluid from the canal after the cancer had been removed from the lower part of the spine; in a fourth, a male, aged ten, death ensued from exhaustion—the spinous apophysis of the second, third, fourth, fifth, sixth, seventh, and eighth dorsal vertebræ were quite destroyed, and the transverse processes carious—two tumours were found adhering to the cord—the cord was unaltered beyond being slightly softened, but its membranes were destroyed; in a fifth, a female, suffering from a cancerous ulceration of the side of the neck, cancerous infiltration of the cellular tissue of the neck, and of the cellular tissue covering the dura mater in the cervical region—from exhaustion; in a sixth, a male, aged seven, death ensued from cerebral symptoms—encephaloid masses were found on the posterior and lower part of the cerebellum, and cancerous degeneration of the restiform and olivary bodies.

#### DIAGNOSIS OF TUMOURS IN THE SPINAL CANAL.

The most characteristic features of tumours in the spinal canal are, first, the pain, which is generally very

severe and of a neuralgic character ; secondly, the paralysis, which sometimes affects one side of the body first, or one more than the other ; thirdly, paralysis of motion being first observed, sensation often remaining unaffected for some time, occasionally throughout the case, if congestion or softening of the cord does not exist, or great pressure exerted on it or the nervous cords, particularly those of the cauda equina ; and, fourthly, the existence of the scrofulous diathesis, or cancer in some part of the body, or enlargement of the bones.

#### TREATMENT OF TUMOURS IN THE SPINAL CANAL.

1. *Of Tubercles.*—Counter-irritations to the spine, strict rest, with the iodide of iron and cod-liver oil internally, seem to be the means on which the chief reliance is to be placed. In addition to these the preparations of opium to allay pain.

2. *Of Osseous Formations.*—Counter-irritation, and the exhibition of iodide of potassium and mercury, seem to be the remedies most likely to be of service.

3. *Of Cancer.*—Counter-irritation seems to be sometimes followed by considerable temporary benefit. The great object of the practitioner must be to allay pain by the free use of opiates, and support the strength by giving cod-liver oil with a nourishing diet.



## CHAPTER VIII.

## ATROPHY OF THE CORD.

ATROPHY of the cord may be either general or partial. The latter is much more frequently observed than the former.

General atrophy of the cord is sometimes congenital, and co-exists with the same state of the brain, or occurs as a termination of general induration of the cord or of the cord and brain. It sometimes occurs from fluid in the spinal canal, particularly when it has been there for some time, or chronic inflammation of the membranes. It is constantly observed in the aged, particularly in those who have been bedridden for some time.

In a man nearly ninety years of age, who had during the last ten years of life gradually fallen into a state of imbecility of mind, accompanied by great feebleness of the body and obtuseness of sensation, both the brain and cord were very much reduced in size; the skull and spinal canal contained a large quantity of citron-coloured serum. It may also occur in the young from excessive and long-continued sexual indulgence.

Partial atrophy is excited by tumours pressing on the

cord, caries, or displacement of the vertebræ, or inflammatory deposits in the membranes. It sometimes occurs on apoplexy of the cord, and as a termination of induration or atony.

#### CHANGES FOUND AFTER DEATH.

The changes found differ considerably. In partial atrophy from pressure—

1. The cord, although diminished in magnitude, may present no alteration in its structure.

2. It may be diminished both in magnitude and consistence. The latter may either be caused by chronic inflammation or by pressure made upon it; the latter form of softening is more frequently observed than the former.

3. It may be diminished in magnitude, the white and grey portions being more or less absorbed, sometimes completely removed, some delicate cellular tissue and serum alone remaining.

The changes observed in general or partial atrophy resulting from disease of the cord, are—

1. Both the white and grey portions are diminished in quantity, particularly the latter, and somewhat friable.

2. The grey portion may be either paler or deeper coloured than usual, and of the consistence of thick mucilage, the white portion being unaffected.

3. The white portion may resemble cartilage or boiled albumen, and be either unusually dense or extremely soft, the grey portion generally participates.

In some cases the cord is reduced to one-half its usual size, occasionally to a third, and in a few instances to a sixth. In the last case it either consists of a cartilaginous cord or a membranous sac formed by the membranes of the cord, the nervous substance having disappeared, leaving only a little delicate cellular tissue and serum, or serum alone.

The nerves invariably participate in the alteration in the cord, in some cases more than in others; sometimes they are only reduced in size without any alteration of structure, but in others all the nervous substance has disappeared, leaving only their sheaths.

The membranes are sometimes thickened and opaque; sometimes they contain cartilaginous or bony deposits.

#### SYMPTOMS OF ATROPHY OF THE CORD.

The most marked symptoms of atrophy of the cord, when it occurs as a primary affection, seem to be defective muscular power, the patient being unable to make much exertion without great prostration of strength: the brain generally participates, at least this was observed in a case which has fallen under my notice, in which symptoms existed which I could only attribute to atrophy of the cord. The patient, a male, was between fifteen and sixteen years of age, but he did not appear from his stature to be more than eleven or twelve. His health had been excellent up to his tenth year, his mental powers good, complexion fresh, and movements lively. At this time he became addicted to onanism. His face



soon became pale, and his body thin. When thirteen years of age he had an attack of fever. It was not severe, but every evening he had an access of mania which lasted from three to four hours. The fever and the maniacal symptoms declined in the course of ten days or a fortnight, leaving him weak and emaciated. He has continued nearly in the same state ever since. His face is extremely pale and thin, eyes languid and surrounded with dark rings; pulse feeble; skin cold and harsh; urine loaded with phosphates; bowels generally confined, motions natural; appetite keen; respiration and heart's action feeble; chest and abdomen free from disease; slight curvature of the spine from always lying with the head buried in the chest and legs drawn up. He usually lies on the sofa, in a half-sleepy state. He rouses himself when desired, walks across the room for ten or fifteen minutes; then his legs begin to drag, and five minutes later he sinks on the floor exhausted.

After resting there for some time, he either crawls into a corner of the room or on to the sofa, where he sleeps for several hours. He always passed a large quantity of urine after these efforts, and the demand for food is much greater than when he remains perfectly quiet.

He can read and talk for a short time; then headache sets in, which, if he perseveres, becomes very severe, and renders both his sight and hearing dull, and exhausts his strength. His testicles are not much larger than peas, and very soft; since the attack of fever he has lost both the power and desire of inducing emissions.



Various plans of treatment have been employed, but without any marked benefit.

The exhibition of sulphate of zinc, strychnine and cod-liver oil, and a cold salt-water douche to the spine, for ten minutes, twice a day, followed by friction with a horse-hair glove, seemed to be followed by beneficial results, but they did not cure him.

## CHAPTER IX.

## CHOREA.—ST. VITUS'S DANCE,

## CAUSES.

I. *Influence of Sex and Age.*—Females are much more liable than males. Of 107 cases which have fallen directly and indirectly under my notice, 86 of the number were females; of 84 observed by Reeve,<sup>1</sup> 57 were females; of 72 contained in Manson,<sup>2</sup> 53; of 189 collected by Rufz,<sup>3</sup> 138; of 317 by Wicke,<sup>4</sup> 210; of 100 by Hughes,<sup>5</sup> 73; of 531 by See,<sup>6</sup> from the Registers of the Hôpital des Enfants of Paris, for 22 years, 393.

It is rarely observed before the sixth year; only 1 out of 91 cases which have fallen under my notice was under this age. It has been, however, observed to exist from birth, by Prichard,<sup>7</sup> Mayo,<sup>8</sup> Monod,<sup>9</sup> Baron,<sup>10</sup> Golding Bird,<sup>11</sup> and Ingleby,<sup>12</sup> the mother in the case observed by the last gentleman, suffered from the

<sup>1</sup> Edin. Med. and Surgical Journal, vol. viii.

<sup>2</sup> Medical Researches, 1825. <sup>3</sup> Arch. Gén. de Méd., 1834.

<sup>4</sup> Versuch einer: Monograph des Grosses Veitztanses, 1844.

<sup>5</sup> Guy's Hospital Reports, 1846.

<sup>6</sup> Sur la Chorée, Mem. de l'Académie, tome xv.

<sup>7</sup> London Medical Repository, 1821.

Outlines of Pathology. <sup>8</sup> Cited by See. <sup>10</sup> Ibid.

<sup>11</sup> Guy's Hospital Reports, 1841. <sup>12</sup> Lancet, 1839-40.

disease in the last month of pregnancy. By Simon and Constant,<sup>1</sup> at four, six, and twelve months; Dorfmueller,<sup>2</sup> at fifteen; and Chrestien,<sup>3</sup> at eighteen; by Manson, at two and a-half, three and a-half, four, and five years. Rufz states that 5 of the 179 cases which he collected were from one to four years of age, and 5 from four to six; Wicke, that 5 out of 317 cases were four years of age, 8 five years; and See, that 28 out of 531 cases were under six years.

The disease is most frequently observed in females from the eighth to the fifteenth year, and in males from the eighth to the sixteenth. It is rarely met with after the twentieth year; but it has been observed by Coxe,<sup>4</sup> Reeve, Babington,<sup>5</sup> and Andral,<sup>6</sup> at forty; Golding Bird, at forty-one; J. P. Frank,<sup>7</sup> at fifty; Manson, in a female, at fifty-four; Paget, in a male, at fifty-eight;<sup>8</sup> Wichmann,<sup>9</sup> in a female, at sixty; Gondinet<sup>10</sup> and Babington, at sixty-three. Powel<sup>11</sup> and Romberg,<sup>12</sup> in females, at seventy; and Bouteille and Roger,<sup>13</sup> at eighty.

The following table, formed from the cases contained

<sup>1</sup> See.                   <sup>2</sup> Hufeland's Journal, bd. xliii. V. Stück.

<sup>3</sup> Médecine Itraleptique.

<sup>4</sup> Ed. Med. and Surgical Journal, vol. xiii.

<sup>5</sup> Guy's Hospital Reports, 1841.   <sup>6</sup> Leçons Orales.

<sup>7</sup> Prax : Med. Univer. Præcept., part ii, vol. iv., 1822.

<sup>8</sup> Edin. Med. and Surg. Journal, vol. lxvii.

<sup>9</sup> Ideen Zur. Diagnostik, bd. ; i., 371.

<sup>10</sup> Annales de Montpel, cited by Bouteille, sur la Chorée, 1810.

<sup>11</sup> Trans. College of Physicians, vol. v.

<sup>12</sup> ArchNerven Krank.

<sup>13</sup> Gén. de Méd. 1854.

in Manson and Hughes, and collected by myself, with the table given by Wicke, will show the ages and sex of 680 cases under 20 years of age :—

	MANSON.		HUGHES.		WICKE.		MYSELF.	
	Males.	Fem.	Males.	Fem.	Males.	Fem.	Males.	Fem.
Before the 4th } year ..... }	1	1	—	—	—	—	—	—
4 years .....	1	1	—	—	1	4	—	—
5 " .....	1	—	1	—	5	3	—	1
6 " .....	1	—	1	1	13	14	—	3
7 " .....	—	1	—	—	7	16	—	3
8 " .....	2	—	3	4	5	10	—	4
9 " .....	2	3	1	9	12	22	4	11
10 " .....	2	6	4	9	15	28	1	5
11 " .....	—	4	1	3	13	26	—	3
12 " .....	1	7	2	8	12	21	1	9
13 " .....	—	6	4	11	6	18	4	9
14 " .....	1	3	3	7	11	19	3	10
15 " .....	1	4	3	4	4	14	2	7
16 " .....	2	6	1	4	6	5	4	8
17 " .....	1	—	1	7	6	10	1	3
18 " .....	—	1	1	4	1	6	—	3
19 " .....	—	2	1	1	—	4	2	4
Total .....	16	45	27	72	107	210	21	86

Of 179 cases collected by Rufz—

5.	3 males to	2 females	were from	1 to 4 years	of age.
5.	2	3	"	4	" 6
51.	16	45	"	6	" 10
118.	30	88	"	10	" 15

2.—*Influence of the Seasons.*—Spangenberg, Blache,<sup>1</sup> and Rilliet and Barthez<sup>2</sup> consider that it is more liable to occur during the summer than at any other time of the year. This opinion is borne out by the observations of Rufz, who found that a greater number of cases (as

<sup>1</sup> Dict. de Méd., art. Chorée. <sup>2</sup> Malad. des Enfants, tome ii.



will be seen from the following table) were admitted into the hospital in the second and third three months of the year than in the first and fourth. Thus of 189 cases—

13 entered in January.	13 entered in July.
13 " " February.	20 " " August.
15 " " March.	19 " " September.
—	—
41 first three months.	52 third three months.
—	—
16 entered in April.	18 entered in October.
17 " " May.	9 " " November.
21 " " June.	15 " " December.
—	—
54 second three months.	42 fourth three months.

In this country, however, the disease seems to occur more frequently in the first and second three months of the year than in the third and fourth, as will be seen from the following table formed from the analysis of the cases contained in Manson and observed myself:—

MANSON.			MYSELF.		
January.....	8	} First three months 24 cases.	.....	6	} First three months 26 cases.
February.....	8		.....	8	
March.....	8		.....	12	
April.....	11	} Second three months 23 cases.	.....	14	} Second three months 32 cases.
May.....	4		.....	6	
June.....	8		.....	12	
July.....	3	} Third three months 15 cases.	.....	4	} Third three months 18 cases.
August.....	4		.....	6	
September.....	8		.....	8	
October.....	1	} Fourth three months 13 cases.	.....	1	} Fourth three months 15 cases.
November.....	8		.....	4	
December.....	4		.....	10	

3. *Influence of Constitution.*—The feeble and delicate, and those of a scrofulous tendency, are more predisposed to this affection than the robust. The

children of the poor, particularly those who are badly fed, clothed and overworked, are more liable than the well-cared-for children of the middle and upper classes. It is rarely observed in the boarding schools in the vicinity of London, or in those of Paris. I have spoken to several gentlemen who have attended schools for several years, and they have informed me that they had very rarely seen the disease. Alard,<sup>1</sup> during twenty-two years, met with only five or six cases at the Maison Royale de St. Denis ; and Huson only one at the College Royale de Louis le Grand.

Of eighteen cases observed by Rufz, fifteen were thin and weak ; and of twenty by Dufossé,<sup>2</sup> fifteen presented the same state, the remaining five being well developed. Of one hundred and ten cases collected by Sec, sixty-eight were feeble, twenty-two moderately developed, and twenty robust. In fifty-one of his cases there was marked emaciation, in twenty-one it was not strongly pronounced, in seven *embonpoint* existed. The skin in one-half of the cases was pallid ; in some it was habitually so ; in others it had supervened on the chorea.

These observations rather show the state of the patients' health when they came under treatment, and not before the disease appeared. In some cases the general health is but little altered, while in others it is rapidly undermined, the patients sinking into a state of extreme debility, which alone often causes it to terminate fatally.

<sup>1</sup> Rufz.

<sup>2</sup> Thèse de Paris, 1836.

The disease frequently occurs from the general health being reduced. I have seen it occur four times in a female aged twelve, and in four others twice, from this cause. To the same cause I could only attribute its occurrence in four cases after measles; in four after scarlet fever; in one instance the patient had also suffered after measles. An instance is recorded in the 25th volume of the Medical and Physical Journal, of a female who had chorea after scarlet fever when three years of age, and after measles when six.

In two cases the disease occurred from this cause, after pneumonia and bronchitis; in two after small-pox and cholera—in the latter case, the patient had had chorea three years before; and in two after obstinate diarrhœa. Guersent<sup>1</sup> has several times seen chorea occur after inflammation of the bowels, in which depletive measures had been largely used.

In one case—a lad, aged thirteen—it supervened on repeated attacks of profuse hæmorrhage from the nose, by which he was very much reduced. Bouteille and Roeser<sup>2</sup> have also observed it excite the disease; the former in a female between ten and twelve years of age; the latter in one aged nine.

In a married female, aged nineteen, who had suffered from chorea when ten years of age, it occurred from severe menorrhagia, which had greatly reduced her. In a case published in the 25th volume of the Medical and Physical Journal, it occurred from severe flooding during

<sup>1</sup> Cited by Blache.

<sup>2</sup> Hufeland's Journal, 1628.

labour ; and in one of the cases (a female aged twenty-one) contained in Dr. Bird's table, it was excited by the excessive abstraction of blood in a disease two years before. Dr. Lever has recorded<sup>1</sup> the case of a female, aged twenty, who was seized with the disease after a miscarriage, in which she lost a considerable quantity of blood.

4. *Hereditary Transmission*.—Chorea is sometimes observed in several children in the same family. Sometimes the mother has suffered, frequently at the same age. In one case the mother<sup>2</sup> had suffered during pregnancy, and the child was born with the disease ; in another in which the child<sup>3</sup> was born with the disease, the mother had been frightened in the latter part of pregnancy. In three of the cases observed by myself the mothers had suffered. Richter,<sup>4</sup> Wichmann, Eveden,<sup>5</sup> Bright,<sup>6</sup> Coste,<sup>7</sup> Constant, Rilliet and Barthez, and Lever, have recorded cases of the mothers having suffered. Hopfengartner<sup>8</sup> and Stiebel<sup>9</sup> have seen it hereditary in some families. See traced an hereditary tendency in eighteen cases. The disease known in Scotland<sup>10</sup> as leaping ague is stated to have been hereditary in some families.

In four instances observed by myself, the disease occurred in two children in the same family ; in one, the

<sup>1</sup> Guy's Hospital Reports, 1847.

<sup>2</sup> Ingleby.

<sup>3</sup> Mayo.

<sup>4</sup> Med. und Chir. Biblioth., bd. v.

<sup>5</sup> Wicke.

<sup>6</sup> Reports.

<sup>7</sup> Thèse de Paris, 1827.

<sup>8</sup> Frank.

<sup>9</sup> Caspar's Wochenschrift, 1831.

<sup>10</sup> Edin. Med. and Surg. Journal, vol. iii.



mother had suffered. Desperièrre,<sup>1</sup> Rufz, and Begbie<sup>2</sup> have seen it occur in two sisters; Detharding<sup>3</sup> in a brother and two sisters, and in three brothers; Wichmann in three brothers—their mother was taken with the disease at sixty; Unwins<sup>4</sup> in three sisters; Crampton<sup>5</sup> in three children in the same family; Flische<sup>6</sup> and Eveden in several; and Dupuytren,<sup>7</sup> Bright, Kirkes, and Ormerod,<sup>8</sup> in a brother and sister.

5. *Influence of Imitation.*—In the synod of Angus and Mearns, and in the Orkney and Shetland Isles,<sup>9</sup> where the disease under the name of leaping ague was endemic, it was often propagated by imitation. Hegner,<sup>10</sup> evidently from this cause, saw it occur in six sisters; Dorf Müller in seven children and adults under the same roof; and Kerner<sup>11</sup> in fourteen children. In Holscher's *Annalen*, 1839,<sup>12</sup> it is stated that all the girls in a school became affected.

In the Orphan Hospital of Milan<sup>13</sup> the disease was once so common that it was thought to be contagious.

<sup>1</sup> Mem. de la Soc. Royale de Méd., 1780.

<sup>2</sup> Edin. Monthly Med. Journal, 1847.

<sup>3</sup> Stransky: Diss. de Choreæ St. Viti, 1822.

<sup>4</sup> Edin. Medical and Surgical Journal, vol. iii.

<sup>5</sup> Transactions of King's and Queen's College, vol. iv.

<sup>6</sup> Op., cited.

<sup>7</sup> Jour. Hebdom., vol. vii.

<sup>8</sup> Medical Gazette, 1850.

<sup>9</sup> Whytt's Works, edited by his Son; and Edin. and Medical and Surgical Jour., vol. iii.

<sup>10</sup> Emphemerid: Miscel. Méd. Cur., 1678-9.

<sup>11</sup> Wicke.

<sup>12</sup> Ibid.

<sup>13</sup> M'Mullin: Edin. Medical and Surgical Journal, vol. i.

Albers,<sup>1</sup> Werkhof,<sup>2</sup> Bright, Dewar,<sup>3</sup> and Begbie have seen it caused by imitation.

6. *Influence of Mental Emotion.*—Fear is one of the most frequent excitants of chorea. It was the cause of the disease in fifteen out of sixty cases which have fallen under my own observation; in thirty-four out of the hundred cases collected and observed by Dr. Hughes; and in twenty-five out of one hundred and twenty-eight by See.

The influence of fright on exciting the disease has been noticed by De Haen,<sup>4</sup> Dilthey Ecker, Sidren,<sup>5</sup> Stoll,<sup>6</sup> Bouteille, and Frank, and nearly every writer on the subject.

In one case it was attributed to the excitement of a ball, in another to excessive joy. Frank, Guersent, and Blache place anger among its causes. The first<sup>7</sup> cites two cases in which it was excited by grief. Bernt<sup>8</sup> considers unrequited love to act as a cause.

The chorea may set in immediately after the mental shock: sometimes, however, several days elapse, and sometimes it is preceded by convulsions, or more or less cerebral disturbance, with fever. In some cases the fright suppresses or retards the appearance of the menstrual discharge, and this excites the chorea.

<sup>1</sup> Frank.

<sup>2</sup> Stransky.

<sup>3</sup> Edin. Medical and Surgical Journal, vol. iii.

<sup>4</sup> Ratio Medenda, i. 388, edit. 1761.

<sup>5</sup> Ploucquet: Lit. Med. Digest, tome i., Tubing., 1808.

<sup>6</sup> Ratio Medenda, iii. 412.

<sup>7</sup> Miscel. Cur. Dec. iii., an. 3 and an. 2.

<sup>8</sup> Monograph: Ch. St. Viti, 1810.

I have frequently observed that the presence of persons or animals disliked by children suffering from the disease has increased the movements.

I am acquainted with several persons who suffer from choreic movements of the face, head, or arm, when excited or suffering from mental anxiety. Sir Charles Bell<sup>1</sup> reports the case of a person who, when anxious, suffered from tremulous motions of the eyelids, and sometimes with contractions of the corners of the mouth.

7. *Influence of Rheumatism and Disease of the Heart.*—(1.) *Rheumatism.*—Chorea frequently occurs in connection with rheumatism or pains in the extremities.

In some cases the rheumatism precedes the chorea ; in others, it accompanies or follows it. The first takes place more frequently than the second ; in some cases the appearance of the chorea was followed by complete cessation of the pains. The occurrence of rheumatism on chorea is but seldom observed. It occurred in one case which I have had an opportunity of observing ; the patient, a male, aged fifteen, had, however, had rheumatism before without chorea. Dr. Yong<sup>2</sup> has seen a case, and Dr. Peacock<sup>3</sup> one, in which chorea was preceded and followed by rheumatism ; in another case observed by him the chorea occurred during the rheumatism, and lasted fourteen days, the rheumatism remaining in abeyance. In a case observed by Dr.

<sup>1</sup> Nervous System, p. 413.

<sup>2</sup> Medico-Chir. Trans. vol. xii.

<sup>3</sup> Medical Times, 1847

Ormerod,<sup>1</sup> the patient had first chorea, then pericarditis, and last of all articular rheumatism.

Rheumatism existed in about ten of the sixty cases which have fallen under my own observation, and in eight of the hundred cases collected and observed by Dr. Hughes. See states that sixty-one out of one hundred and twenty-eight cases occurred in connection with rheumatism or articular pains. He gives the following table of 133 cases.

In 71, the chorea was preceded in 41 by acute arthritis; in 30 by articular pains.

In 15, the chorea was accompanied in 7 by acute arthritis; in 8 by articular pains.

In 30, the chorea was accompanied by external and internal rheumatism.

In 17, the chorea was accompanied by internal rheumatism.

Chorea sometimes occurs several times without rheumatism. See states that in one case (85) the patient had four attacks of chorea, the third with acute rheumatism. In a case observed by Romberg it did not occur until the fifth attack.

The connection of rheumatism with chorea has been noticed by Sauvages,<sup>2</sup> Stoll,<sup>3</sup> Ploucquet,<sup>4</sup> Bouteille, Home,<sup>5</sup> M'Mullin, Chrestien, Copland,<sup>6</sup> Prichard,<sup>7</sup>

<sup>1</sup> Cited by Dr. Kirkes.      <sup>2</sup> Nosology, i. 592. Ed. 1761.

<sup>3</sup> Ratio Medenda, tome iii., 70 and 78. Ed. 1780.

<sup>4</sup> Dissert., 1787: cited in Lit. Med. Digest.

<sup>5</sup> Hamilton on Purgatives.

<sup>6</sup> London Med. Reposit., vol. xv.

<sup>7</sup> Ibid., xxi.



Hawkins,<sup>1</sup> Scudamore,<sup>2</sup> Marolan,<sup>3</sup> Frank, Bright, Romberg, Paget, Babbington,<sup>4</sup> Burrows,<sup>5</sup> Legendre,<sup>6</sup> Todd,<sup>7</sup> Begbie, Peacock, Fischer, Legrand,<sup>8</sup> Lacase,<sup>9</sup> Nairne,<sup>10</sup> See, Kirkes, Ormerod, Mesnet,<sup>11</sup> and several others.

(2.) *Disease of the Heart*.—Disease of the heart, or pericardium, both of a rheumatic and non-rheumatic character, is very apt to induce or occur in connection with chorea. Alteration of the heart's sounds, from anæmia, and from a state intimately allied with the chorea (cardiac chorea) depending on undue contraction during the systole and relaxation during the diastole, is also frequently observed.

I have lately had opportunities of observing two cases of this kind. In one case the patient, a female, aged eleven, had been suffering from choreic movements of the arms and left leg for six weeks. The first sound was blowing and prolonged, the second feeble. As the choreic movements subsided, the heart's sounds recovered their natural character. In the second case, a female, aged thirteen, the alteration in the first sound was more marked when the choreic movements were worse, which was particularly the case after exertion, and towards night. The chorea disappeared and reappeared several times, never entirely leaving her until the heart's sounds resumed their natural character.

<sup>1</sup> Medical and Physical Journal, vol. vii.

<sup>2</sup> On Rheumatism.

<sup>3</sup> See.

<sup>4</sup> Guy's Hospital Reports, 1841.

<sup>5</sup> Medical Gazette, 1843.

<sup>6</sup> Rilliet and Barthez.

<sup>7</sup> Med. Gazette, 1842.

<sup>8</sup> See.

<sup>9</sup> Ibid.

<sup>10</sup> Med. Gazette, 1850.

<sup>11</sup> Arch. Gén. de Méd., 1856.

It seems quite possible for chorea to induce permanent disease of the heart. In two cases—a female, aged twenty-one, and a male, aged eighteen—the disease of the heart was attributed to severe attacks of chorea; neither had ever had rheumatism.

The occurrence of disease of the heart in chorea was noticed by Willan,<sup>1</sup> in 1801, who, in two cases, found fluid in the pericardium and in the ventricles of the brain; Forgues,<sup>2</sup> in 1811, who found flocculent lymph and serum in the pericardium; Copland,<sup>3</sup> in 1818, who found six ounces of serum in the pericardium, lymph on the heart, and hypertrophy of the left ventricle; Abercrombie,<sup>4</sup> in 1824, who found the pericardium covered with a thick layer of lymph, and adhering to the heart—the surface of the heart dark-coloured, and very vascular; Prichard,<sup>5</sup> in 1824, who found the pericardium adhering to the heart; and Roeser,<sup>6</sup> in 1828. In 1839,<sup>7</sup> Dr. Bright published several cases. Dr. Yong in 1840,<sup>8</sup> Drs. Babington and Addison in 1841,<sup>9</sup> Dr. Todd in 1842,<sup>10</sup> Drs. Burrows<sup>11</sup> and Favel, in 1843,<sup>12</sup> Dr. Taylor in 1845,<sup>13</sup> Dr. Hughes in 1846,<sup>14</sup> Dr. Peacock<sup>15</sup>

<sup>1</sup> Diseases of London, 1801.

<sup>2</sup> Diss. Med. Choreæ. Edin. 1811: cited by See.

<sup>3</sup> London Med. Reposit., 1821.

<sup>4</sup> Edin. Medico-Chir. Trans., 1824.

<sup>5</sup> London Med. Reposit., 1824.

<sup>6</sup> Hufeland's Journal.

<sup>7</sup> Medico-Chir. Transact.

<sup>8</sup> Ibid

<sup>9</sup> Guy's Hospital Reports.

<sup>10</sup> Medical Gazette.

<sup>11</sup> Ibid.

<sup>12</sup> Trans. Medical Society of Sheffield.

<sup>13</sup> Medical Argus.

<sup>14</sup> Guy's Hospital Reports.

<sup>15</sup> Medical Times.

in 1847, Mr. Gabb in 1849;<sup>1</sup> and Drs. See,<sup>2</sup> Nairne, Ormerod, and Kirkes,<sup>3</sup> in 1850.

Of thirty-four cases, in five the chorea occurred with disease of the heart unconnected with rheumatism at the time of its appearance. In one case, a female, aged sixteen,<sup>4</sup> it occurred in the third week of carditis and pericarditis; in a second, a female, aged twenty,<sup>5</sup> symptoms of disease of the heart were noticed seven days before the chorea set in; in a third, a female, aged seventeen,<sup>6</sup> chronic disease of the heart from rheumatism three years before, chorea from suppression of the menstrual discharge; in a fourth, a male, aged ten,<sup>7</sup> chorea at six, rheumatism with inflammation of heart and lungs at nine, four weeks before admission pain in the chest, and one week later chorea; in a fifth, a male, aged nine,<sup>8</sup> suffering from disease of the heart for some months.

Of the twenty-three of the twenty-nine remaining cases, the chorea occurred during acute rheumatism, with inflammation of the heart or its coverings, generally both. In one case, a female, aged nine;<sup>9</sup> in a second, a female (young);<sup>10</sup> in a third, a male (an adult);<sup>11</sup> both had roseola annulata; in a fourth, a female (young);<sup>12</sup> in a fifth, a male, aged eleven,<sup>13</sup> he had suffered once before; in a sixth, a female, aged sixteen,<sup>14</sup>

<sup>1</sup> Assoc. Med. Journal.

<sup>3</sup> Medical Gazette.

<sup>5</sup> Kirkes.

<sup>9</sup> Rocser.

<sup>13</sup> Bright

<sup>6</sup> Myself.

<sup>10</sup> Bright.

<sup>14</sup> Hughes.

<sup>2</sup> Sur la Chorée.

<sup>4</sup> Abercrombie.

<sup>7</sup> Ormerod.

<sup>11</sup> Ibid.

<sup>8</sup> Favel.

<sup>12</sup> Ibid.



she had also suffered before ; in a seventh, a male (young),<sup>1</sup> rheumatism remained after the chorea had ceased ; in an eighth, a male, aged sixteen ;<sup>2</sup> in a ninth, a female, aged thirteen ;<sup>3</sup> in a tenth, a female, aged sixteen,<sup>4</sup> she had had rheumatism several times ; in an eleventh, a male, aged seventeen,<sup>5</sup> he had had rheumatism several times since his twelfth year ; in a twelfth, a male, aged thirteen,<sup>6</sup> he had had acute rheumatism twice before ; in a thirteenth case, a male, aged twelve,<sup>7</sup> he had rheumatism for a few days, improved, relapsed, chorea, and endocarditis ; in a fourteenth, a female, aged twenty-four,<sup>8</sup> acute rheumatism, accompanied by pain in the region of the heart, but no abnormal sound, the rheumatism declined, not uniformly but remittingly, third week chorea with pericarditis ; in a fifteenth case, a female, aged nineteen,<sup>9</sup> acute rheumatism, which subsided in six or seven days, when chorea set in : the pericardium was found adhering to the heart ; in a sixteenth, a female, aged twenty-one,<sup>10</sup> acute rheumatism of the left knee, wrist and arm, lasting for ten days, when they subsided, and symptoms of pericarditis set in, accompanied by slight choreic movements of the left arm ; in a seventeenth, a male, aged nineteen,<sup>11</sup> when convalescent from acute rheumatism, chorea, accompanied by disease of the heart ; in an eighteenth, a male, aged nineteen ;<sup>12</sup> in a nineteenth, (age and sex not stated),<sup>13</sup>

<sup>1</sup> Bright.<sup>2</sup> Ormerod.<sup>3</sup> Kirkes.<sup>4</sup> Babington.<sup>5</sup> Nairne.<sup>6</sup> Myself.<sup>7</sup> Gabb.<sup>8</sup> Burrows.<sup>9</sup> Prichard.<sup>10</sup> Myself.<sup>11</sup> Bright.<sup>12</sup> Yong.<sup>13</sup> Sec.



in a twentieth, a female, aged twenty-one;<sup>1</sup> in a twenty-first, a female, aged seventeen;<sup>2</sup> in a twenty-second, a female, aged fourteen;<sup>3</sup> in a twenty-third, a female, aged fifteen,<sup>4</sup> on the occurrence of the chorea the abnormal sounds of the heart subsided, but the heart acted tumultuously.

In three of the six remaining cases chorea was observed first. In one, a female, aged thirteen,<sup>5</sup> suffering from chorea, when pericarditis set in, and later acute rheumatism; in a second, a female, aged fifteen,<sup>6</sup> chorea for four months, then acute rheumatism and endocarditis; in a third, a female, aged nine.<sup>7</sup>

Of the remaining three cases; in one a female, aged nine,<sup>8</sup> the chorea followed rheumatism, and was again followed by rheumatism; in the second, the chorea occurred during the rheumatism, and lasted fourteen days, the rheumatism remaining in abeyance: the rheumatism ended by inducing disease of the heart and dropsy; in the third, the patient, a male,<sup>9</sup> had had acute rheumatism, followed by chorea, six months later spinal meningitis, with symptoms of disease of the heart, and eight months later chorea, with paralysis of the muscles of voluntary motion.

8. *Influence of injuries on the head; diseases of the brain or its membranes; convulsions, hysteria, &c.*

(1.) *Blows or falls on the head* may produce the affection, by inducing, first, injury of the brain;

<sup>1</sup> Favel,

<sup>2</sup> Hughes.

<sup>3</sup> Ibid.

<sup>4</sup> Babington.

<sup>5</sup> Ormerod.

<sup>6</sup> Hughes.

<sup>7</sup> Peacock.

<sup>8</sup> Ibid.

<sup>9</sup> Copland.

secondly, inflammation of the membranes ; and thirdly, from the mental shock. Of twelve cases in which the chorea appeared after injury to the head—in one, a male, aged thirteen;<sup>1</sup> in a second, a female, aged thirteen;<sup>2</sup> in a third, a female (an infant),<sup>3</sup> two days after a fall on the head ; in a fourth, a male, aged seven,<sup>4</sup> seven days after a fall on the back of the head against a door-step ; in a fifth, a female, aged eight,<sup>5</sup> from a fall on the head : in this case symptoms of meningitis set in, and after they had subsided the chorea appeared ; in a seventh, a female, aged thirteen,<sup>6</sup> from a fall ; in an eighth, a male, aged thirteen,<sup>7</sup> from a blow on the head ; in a ninth, a female, aged six,<sup>8</sup> from a blow on the head, which knocked her down ; in a tenth, a scrofulous female,<sup>9</sup> from a blow on the back of the head, from a window-sash falling—no pain in the head followed, but chorea set in a week afterwards ; in an eleventh, a male, aged thirteen,<sup>10</sup> one month after a wound on the vertex ; in a twelfth, a female, aged sixteen,<sup>11</sup> from a fall on the back of the head : headache was excited, and chorea set in two months after the injury. Rilliet and Barthez met with a case in which it did not set in for six months after a blow on the temple. Patterson<sup>12</sup> considered that

<sup>1</sup> Schenkus : Obs. de Capit. xxxi. cited by Bouteille.

<sup>2</sup> Marc. Diss. Sistens Morb. Rarior., 1792.

<sup>3</sup> Bouteille.

<sup>4</sup> Myself.

<sup>5</sup> Myself.

<sup>6</sup> Griffiths ; Phil. Med. Examiner.

<sup>7</sup> Bateman ; Edin. Med. and Surgical Journal, vol. ix.

<sup>8</sup> Guy's Hospital Reports, 1844.

<sup>9</sup> Unwins ; Edin. Med. and Surg. Jour., vol. viii.

<sup>10</sup> Bright, cited by Babington. Lancet, 1838-9.

<sup>12</sup> Med. and Physical Journal, vol. xv.

a blow on the head, received several years before, had excited it. Webster<sup>1</sup> saw choreic movements occur in a gentleman who had received a blow on the left parietal bone. Frese,<sup>2</sup> Schlegel<sup>3</sup> and Bright<sup>4</sup> have seen it excited by blows on the head.

(2.) *Diseases of the brain and its membranes, epilepsy, &c.*—I have just alluded to a case in which symptoms of meningitis, excited by a blow on the head, was followed by chorea; in a second case, a female, aged eight, general convulsions and headache preceded the chorea. Schwartz<sup>5</sup> has seen it occur after convulsions. In a third case, a female, between ten and twelve,<sup>6</sup> it was preceded and accompanied by lethargy; in a fourth case the patient, a female, aged sixteen,<sup>7</sup> laid for two days, before the chorea appeared, in a trance; in a fifth, a female, aged ten,<sup>8</sup> the chorea was preceded for five nights by great agitation, loud singing hurried respiration and increased action of the heart, pulse 140, the attacks lasted from three to four hours, when they gradually declined—the chorea followed the fourth attack; in a sixth, a female, aged thirteen,<sup>9</sup> it was preceded by headache, sore throat, and hysterical sensations, with delusions at times, particularly at night. Kleefing<sup>10</sup> has seen it occur on delirium and fever.

When the disease occurs from fright, cerebral disturbances, and sometimes fever, precede it.

It has also been observed to occur in connexion with

<sup>1</sup> Lancet, 1840.

<sup>2</sup> Wichmann.

<sup>3</sup> Wicke.

<sup>4</sup> Reports.

<sup>5</sup> Wicke.

<sup>6</sup> Bouteille.

<sup>7</sup> Unwins.

<sup>8</sup> Myself.

<sup>9</sup> Bright.

<sup>10</sup> Wicke.



mania, idiocy, congestion of the brain and its membranes, acute and chronic meningitis, softening, induration, alone or with induration of the cord, apoplexy, tumours, tubercles and abscesses.—(*See changes found after death.*)

*Epilepsy.*—Frank considered that convulsions were liable to excite the disease. They have been observed in connection with it by Esquirol,<sup>1</sup> Georget,<sup>2</sup> Addison,<sup>3</sup> Golding Bird, Hughes, and myself. The epilepsy generally precedes the chorea, but it may occur during it; in some cases the choreic movements become so severe as to assume all the characteristics of epilepsy; when this occurs it nearly always terminates fatally.

It sometimes occurs in connection with hysteria, melancholia, and somnambulism.

9. *Influence of blows on the spine; diseases of the spine and spinal cord and its membranes.*—(1.) *Blows on the spine* sometimes produce chorea, although they seem less liable to do so than blows on the head. I have seen only one case—that of a female aged twelve—in which the chorea could be attributed to this cause: it set in two days after the receipt of the injury. In a second case, a male, aged nine,<sup>4</sup> who had had chorea before, it was excited by falling and bruising the sacrum; in a third, a female,<sup>5</sup> from falling on the back; in a fourth, a male, aged thirteen,<sup>6</sup> from being severely beaten across the shoulders.

<sup>1</sup> See.

<sup>2</sup> Dict. des Sc. Médicales, art. Chorée.

<sup>3</sup> Golding Bird.

<sup>4</sup> Todd: Lancet, 1842-3.

<sup>5</sup> Webster: Ibid., 1840.

<sup>6</sup> Prichard.



(2.) *Disease of the spine.*—It has been observed by Froriep,<sup>1</sup> in a male, aged nine, in whom the odontoid process of the second cervical vertebra was found exostosed and pressing on the cord; and in a second case, a male, aged thirty-two, suffering from abscess and caries of the bones of the face, the odontoid process was found elongated, the vessels on the surface of the brain injected, the arachnoid of the base of the brain covered with yellow exudation; the pia mater covering the medulla oblongata was similarly affected, and the basilar artery ossified.

Lieutaud<sup>2</sup> mentions the case of a female who suffered from agitations. After death a tumour was found on the bodies of the lumbar vertebræ. Harrison<sup>3</sup> saw it occur in connection with projection of the lumbar vertebræ. The chorea disappeared as the projection subsided.

Stiebel<sup>4</sup> considers that enlargement of the seventh cervical vertebræ causes the disease. It does sometimes occur in patients suffering from curvature of the spine. Frank and Dufossé place it among the exciting causes. The same cause, namely, debility, excites both; beyond this they seem to have little to do with each other. When they occur together, the chorea is generally the first to disappear, the other remaining for months or years, sometimes for life—the chorea rarely returning.

(3.) *Disease of the membranes and cord.*—Irritation of the motor portions of the cord and brain is one of the

<sup>1</sup> Neue Notizen, 1839.

<sup>2</sup> Hist. Anat. Med. Sistens.

<sup>3</sup> Lancet, 1828-9.

Cited by Romberg.

most frequent causes of clonic convulsions. Hence chorea is very liable to occur from congestion or inflammation of the membranes of the cord, exostosis of the vertebræ, thickening of the ligaments, tumours, exudatory deposits, and in congestion and induration of the cord. (*See changes found after death.*)

10. *Influence of affections of the intestinal canal and Worms.*—Frank places alterations of the mucous membranes of the first passages as one of the causes of the disease. Ingelby found ulceration of the bowels in a fatal case. It has been observed to occur in three females, aged respectively fourteen,<sup>1</sup> fifteen,<sup>2</sup> and fifteen,<sup>3</sup> suffering from chronic gastritis; in one of the cases fright excited the disease.

(1.) *Sordes.*—It has been observed to occur from this cause by Horstius,<sup>4</sup> De Haen,<sup>5</sup> (to re-excite it); Bruckmann, Strack,<sup>6</sup> Camper,<sup>7</sup> Bècamp,<sup>8</sup> Bouteille, Hamilton, M'Mullin, Frank, Paget, Rilliet and Barthez, and Addison.

(2.) *Worms.*—The occurrence of the disease from worms has been noticed by Moller,<sup>9</sup> Gaubius,<sup>10</sup> Paulin,<sup>11</sup> Baldinger,<sup>12</sup> Krebs,<sup>13</sup> Regler,<sup>14</sup> Wendt,<sup>15</sup> Bouteille, Chivaud,<sup>16</sup> Thelinius, and Frank. Also by Cansbrach,

<sup>1</sup> Clark : Edin. Med. and Surgical Journal, vol. iv.

<sup>2</sup> Crichton : Ibid., vol. xxxi.

<sup>3</sup> Myself.

<sup>4</sup> Stransky.

<sup>5</sup> Ratio Medend., i., 381.

<sup>6</sup> Stransky.

<sup>7</sup> On the Female Pelvis.

<sup>8</sup> Jour de Méd., tome xxix.

<sup>9</sup> Emph. Mis. Méd. Cur. 1660-44.

<sup>10</sup> Sauvages.

<sup>11</sup> Obs. Med., 1736.

<sup>12</sup> Neus Magazin, bd. ix.

<sup>13</sup> Med. Beobacht.

<sup>14</sup> Ploucquet.

<sup>15</sup> Nachricht.

<sup>16</sup> Bouteille.

Guthner, Hadsbauer, Dessessartz, Engelberg, Hopfengartner, Schwartz, Sturm,<sup>1</sup> Dorfmueller, Hufeland,<sup>2</sup> Fischer,<sup>3</sup> Bach,<sup>4</sup> and myself.

Both Rufz and See consider the existence of worms to be only accidental, and that they have nothing to do with exciting the disease. This is no doubt the case in some instances; but there are others in which the expulsion of worms has been followed by the subsidence of the chorea. This has been observed by Moller, Stoll, Bouteille, Chivaud, Bruckmann, Desessartz, Engelberg, Hopfengartner, Schwartz, Sturm, Dorfmueller, Fischer, and myself.

Of three cases observed by myself, in one: a male, aged ten, the chorea immediately began to subside on the discharge of three lumbar worms, although oxide of zinc had been given for several weeks without relief. In the second and third cases the patients, females, aged respectively eighteen and twenty-three years, were suffering from tape-worm, the expulsion of the worm was followed by marked relief, and the movements soon subsided; the mother of one of the patients had also suffered from chorea from the same cause, and had been cured by the expulsion of the worm.

11. *Influence of disease of the womb; suppression or retardation of the menstrual discharge; and pregnancy.*

—(1.) Dr. Bright observes that acute inflammation of the womb may induce chorea. In a case of inflammation of the womb and vagina excited by the injudicious use of the forceps; choreic movements of the muscles of the

<sup>1</sup> Wicke.

<sup>2</sup> Journal, bd. xlv.

<sup>3</sup> Oest. Wochenschrift, 1841.

<sup>4</sup> Golding Bird.



abdomen and thighs existed. Romberg reports the case of a female, aged forty-eight, in whom the disease was excited by a severe labour.

Active congestion of the womb and ovaries, and sudden suppression of the menstrual discharge by fright or cold, may excite the disease, particularly before the fourteenth or fifteenth year.

(2.) *Pregnancy*.—The occurrence of chorea during pregnancy seems to have been first noticed by Riedlin in 1696,<sup>1</sup> Caspar in 1697,<sup>2</sup> and Gullmann in 1722.<sup>3</sup> An instance is recorded in the "Journal de Parme" towards the close of the last century. Franks'<sup>4</sup> father met with a case. It has been also observed by Bright,<sup>5</sup> Hufeland,<sup>6</sup> Bell,<sup>7</sup> Carls,<sup>8</sup> Romberg, Beer,<sup>9</sup> Ingelby, Duncan,<sup>10</sup> Turner,<sup>11</sup> Lever,<sup>12</sup> Richelot,<sup>13</sup> Dubois,<sup>14</sup> and See.

Of the twenty cases recorded, in seventeen the disease appeared during the first pregnancy ; in four during the second—two had suffered during the first ; in one case it appeared in the fifth pregnancy ; in another the patient suffered during the first third or half of every pregnancy.

<sup>1</sup> *Lineæ Medicæ*, 321.

<sup>2</sup> *Emphemerid*, *Mis. Med. Cur.*, 1697-8, 637.

<sup>3</sup> *Ibid.*, 1722, 296.      <sup>4</sup> *Prax. Med. Univer. Præcept.*, 1800.

<sup>5</sup> *Reports*.      <sup>6</sup> *Journal*, 1835, vi. Stück.

<sup>7</sup> *On Nervous System*, 416.      <sup>8</sup> *Wicke*.

<sup>9</sup> *Romberg*.      <sup>10</sup> *Edin. Med. and Surg. Journal*, vol. lxxxix.

<sup>11</sup> *Med. Gazette*, 1837-8

<sup>12</sup> *Guy's Hospital Reports*, 1847.

<sup>13</sup> *See*.      <sup>14</sup> *Ibid.*



The disease may set in at any period of gestation, but it is most liable to occur immediately or soon after impregnation, or during the first half of pregnancy than at any other period. Thus, in eighteen cases in which the period at which the disease commenced is stated, in five it set in when the patients became pregnant; in two soon after; in two in the second month; in two in the fourth month; in one in the fifth month—for three months the patient had dropped everything from her hands; in two in the sixth month; in two in the seventh month; and in two in the ninth.

The patients in nearly all the cases were from nineteen to twenty-four years of age.

12. *Influence of diseases of the respiratory organs, peritoneum, kidneys, fevers continued, remittent, and exanthematous.*—(1.) *Diseases of the lungs.*—Evers has seen it occur in disease of the lungs: Rufz, in connection with pneumonia, and Romberg with catarrh and emphysema. See states that pneumonia existed in seven out of 128 cases which he collected. Jadelot<sup>1</sup> met with a case which was nearly cured when catarrh set in and caused the chorea to reappear with increased severity. Bouteille saw it occur after an emetic of ipecacuanha given to a female between ten and twelve, suffering from cough, difficulty of breathing, and fever. I have seen it occur after pneumonia and bronchitis; Cansbrach, Carl, and Bright<sup>2</sup> after catarrh. I have seen it occur during and after hooping cough.

<sup>1</sup> Brouillaux Leger : Thèse de Paris, 1820.

<sup>2</sup> Golding Bird.

(2.) *Peritonitis*.—Bandelocque, Constant,<sup>1</sup> Rufz, and Romberg, have seen it occur in connection with this disease.

(3.) *Diseases of the kidneys*.—In two cases the chorea occurred during dropsy; in one after scarlet fever; in the other after measles. Drs. Babington and See have also seen it occur in connection with dropsy.

(4.) *Fevers*.—*Continued fever*.—Chorea seems to occur but seldom in connection with fever. In two cases this was observed. In one, from the commencement of the fever; in the other, towards the close of the second week. Stoll saw it occur with fever, and decline with it. In another case observed by him, the chorea which had resisted every remedy, disappeared on the occurrence of fever. Rilliet and Barthez have seen it occur in the advanced stage of fever, and Babington from fever.

*Intermittent fever*.—It has been observed to occur during ague by Thelenius and Brandis;<sup>2</sup> after it by Sumiere<sup>3</sup> and Hufeland.<sup>4</sup> In a case recorded in "The Lancet" for 1826-7, ague occurred during the chorea, and aggravated it.

*Remittent Fever*.—It occasionally occurs on remittent fever.

*Exanthematous fever*.—*Small-pox*.—Chorea may occur 1st, during the premonitory symptoms of small-pox, easing on the appearance of the eruption;<sup>5</sup> 2ndly, from

<sup>1</sup> See.

<sup>2</sup> Wicke.

<sup>3</sup> Jour. de Méd., tome xxxv. Bouteille.

<sup>4</sup> Journal, bd. xlii., V. Stück, 97.

<sup>5</sup> Myself.

suppression of the eruption ;<sup>1</sup> 3rdly, during the debility succeeding it.<sup>2</sup>

See, Piet,<sup>3</sup> and Green<sup>4</sup> have seen the movements aggravated during the premonitory symptoms of small-pox. In a case observed by Piet, the chorea ceased on the appearance of the pustules.

*Scarlet fever.*—As in small-pox, chorea may occur, 1st, during the premonitory symptoms,<sup>5</sup> or be aggravated by them ;<sup>6</sup> 2ndly, from the suppression of the eruption ;<sup>7</sup> and, 3rdly, during the debility or dropsy succeeding it.<sup>8</sup> Legendre<sup>9</sup> has seen chorea of two months' duration decline on the appearance of scarlet fever.

*Measles.*—Chorea has been observed by Bouteille to occur with the premonitory symptoms of measles, disappearing during the eruption, but re-appearing on its subsiding. Legendre has seen it disappear on the occurrence of the premonitory symptoms of measles. It has been observed to follow measles in a boy and a girl by Wicke, See, and myself. Unwins has seen it occur after an eruptive fever, and Duncan<sup>10</sup> after miliary fever.

13. *Influence of diseases of the scalp, skin ulcers, &c.*—Wendt<sup>11</sup> has seen it occur from the suppression of favus, Pelargus<sup>12</sup> of impetigo, Hufeland<sup>13</sup> of tinea capitis,

<sup>1</sup> Sallabal : De Morb., Varol, 1788.

<sup>2</sup> Stoll, Bouteille, Babington and Hughes.

<sup>3</sup> Rilliet and Barthez. <sup>4</sup> Lancet, 1836-7.

<sup>5</sup> Schneider : Wicke. <sup>6</sup> Myself. <sup>7</sup> Sallabal.

<sup>8</sup> Med. and Physical Journal, vol. xxiv.

<sup>9</sup> Hughes and Myself. <sup>10</sup> Frank.

<sup>11</sup> Nachricht.

<sup>12</sup> Ploucquet. <sup>13</sup> Journal, bd. vi.



See on the disappearance of eczema ; Thelinus, Darwin,<sup>1</sup> and Kulam from the suppression of itch. In the case observed by Darwin it occurred from wearing a mercurial girdle ; the chorea disappeared on the itch re-appearing. In Kulam's case the disease also disappeared on the re-appearance of the itch. An instance is recorded in the *Emphemerid. Nat. Cur.* for 1752, of a female, aged twenty, who was taken with the disease on the disappearance of scabies. Heinke, Lentilius,<sup>2</sup> Bernt, and Goindinet,<sup>3</sup> on the healing of ulcers ; Thelinus, Ploucquet,<sup>4</sup> Bonnafox,<sup>5</sup> and Frank from suppression of the perspiration ; Golding Bird from exposure to intense cold.

*Difficult dentition.*—Mechlin,<sup>6</sup> in a female either from difficult dentition or worms ; Monro,<sup>7</sup> in a young lady while cutting a molar tooth ; it ceased on lancing the gum. Gregory,<sup>8</sup> in a boy while cutting the second set of teeth ; in another case the disease soon got well after scarifying the gums. Hufeland, in a female aged seven.<sup>9</sup> Bailly and Meyraux,<sup>10</sup> in a female ; and Cumming,<sup>11</sup> in a female from six to eight years of age.

An instance is recorded in the *Emphemerides* for 1696 of the disease occurring in a girl suffering from a tumour of the arm. Dr. Kingston,<sup>12</sup> in a female, aged thirty-five, who had been affected for thirty years, from disease of the elbow-joint. Dr. Babington saw it occur

<sup>1</sup> Zunomia.<sup>2</sup> Wicke.<sup>3</sup> Bouteille.<sup>4</sup> Frank.<sup>5</sup> Bouteille.<sup>6</sup> *Emphemerid. Nat. Cur.*, 1694, p. 304.<sup>7</sup> M'Mullin.<sup>8</sup> Ibid.<sup>9</sup> *Journal*, bd. lvii.<sup>10</sup> *Arch. Gén. de Méd.*, 1825.<sup>11</sup> Begbie.<sup>12</sup> Webster.



in a female, aged seventeen, suffering from thickening of the anterior part of the radius, ten years before she had broken the arm; and in the stump of a female, aged twenty, who had had the arm amputated for scrofulous disease of the elbow-joint four or five months before. Mr. Callaway,<sup>1</sup> in a male, aged forty, who had his jaw dislocated, the movements were confined to the jaw. Frank states that it has been observed to occur from compression of the feet and growing in of the nails.

Geach has recorded the case of a midshipman who received a wound of the eye from a small sword. He fell down insensible, with loss of speech and hemiplegia of the opposite side of the body. "As he began to mend he was taken with loud fits of laughter or long-continued simpering, and on attempting to walk he suffered from chorea, one leg being thrown eagerly forward, the other dragging and trembling."

*Onanism.*—Lassaverie,<sup>3</sup> Jadelot,<sup>4</sup> Frank, Piorry,<sup>5</sup> and Kirchner<sup>6</sup> have seen it caused by onanism. Lullier<sup>7</sup> has seen it occur from pain in one of the testicles.

#### CHANGES FOUND AFTER DEATH.

In one set of cases no changes are found after death, either in the brain, spinal cord, or any other part of the body; in a second, the changes are confined to the organs of the chest or abdomen; in a third, changes are found in the brain or its membranes, or the cord and its membranes.

<sup>1</sup> Golding Bird.

<sup>2</sup> Phil. Trans., vol. liii, 234.

<sup>3</sup> Bouteille.

<sup>4</sup> Jour. de Méd., 1808.

<sup>5</sup> Oesterich Med. Jahrb., bd. xvi.

<sup>6</sup> See.

<sup>7</sup> Bouteille.

1. *No changes in the brain or cord.*—Ollivier,<sup>1</sup> Rostan,<sup>2</sup> Dugès,<sup>3</sup> Blache, Addison,<sup>4</sup> and Gerhard,<sup>5</sup> have each seen a case in which there was no change found in the brain or cord. Grisolle<sup>6</sup> in three cases, and See in five cases examined at the Hôpital des Enfants, states that no changes were found. Delafond,<sup>7</sup> destroyed a number of animals, particularly dogs, at different periods of the disease, but without finding any alteration in the nervous system. Mr. Edward Mayhew has informed me that he found no alteration in dogs who had died from the disease.

2. *Changes in organs without any alteration in the Brain or cord.*—In one case;<sup>8</sup> tubercles were found in the lungs, pancreas, mesentery, and omentum; in a second,<sup>9</sup> the tricuspid valve presented some minute granulations; in a third,<sup>10</sup> granulations existed on the mitral valve; in a fourth,<sup>11</sup> the pericardium was ecchymosed and contained six ounces of flaky serum, the vessels on the surface of the cord were rather large, and old adhesions existed between its membranes; in a fifth,<sup>12</sup> the pericardium and the adjacent parts of the lungs were inflamed, the pericardium adhered to the heart by lymph, and the semilunar and mitral valves were covered with recent vegetations; in a

<sup>1</sup> Malad. de la Moel. Epin.

<sup>2</sup> Essais Physiologique et Pathologique.

<sup>3</sup> Med. Clinique, tome ii.

<sup>4</sup> Webster.

<sup>5</sup> See.

<sup>6</sup> Pathol. Interne, tome ii. ed. 1855.

<sup>7</sup> Foulhioux.

<sup>8</sup> Hawkins.

<sup>9</sup> Babington.

<sup>10</sup> Kirkes.

<sup>11</sup> Addison.

<sup>12</sup> Bright.

sixth,<sup>1</sup> the pericardium adhered to the heart, from old and recent adhesions, the aortic and mitral valves were covered with vegetation; pleuritis also existed, and congestion of the lungs. In all these cases the patients died worn out by the disease.

3. *Changes in the brain and cord without any alteration in the other organs.* These varied considerably, depending greatly upon whether the patients died comatose, in convulsions, or from exhaustion.

Thus, in seven cases which terminated fatally by coma, the sinuses and vessels on the surface of the brain were injected; and in three out of four cases examined, those of the spinal canal were also congested. The brain was injected in five of the seven cases,<sup>2</sup> the cord in two of the four. In four of the seven cases the ventricles contained serum, in two they were much distended. In one of the four cases the spinal canal contained a large quantity of serum. In one case, slight adhesions existed between the visceral and parietal folds of the cerebral arachnoid; in a second, calcareous deposit in the centre of the left hemisphere; in a third, from enlargement of the odontoid process of the second cervical vertebra, a depression existed on the medulla oblongata, and the membranes of the cord at this point were opaque and thickened.

Of three cases<sup>3</sup> in which the patients died delirious:

<sup>1</sup> Hughes.

<sup>2</sup> Coxe; Patterson; Medico-Chir. Review, 1829; Froriep; Legendre; Hörstel, Schmidt's Jahrbücher, 1849; Myself.

<sup>3</sup> Prichard; Laird, cited by Babington.



in two the brain and pia mater were injected, in one serum existed under the arachnoid, and from two to three ounces of serum in the spinal canal. In the third case, the spinal canal contained a large quantity of serum, and the vessels on the surface of the cord were injected: the patient, a male, aged seven, had suffered since birth.

In two cases,<sup>1</sup> in which the patients died in convulsions: in one the central parts of the cerebrum were rather injected, the cerebellum pulpy, the grey portion of the upper third of the cord injected, and the vessels on the surface of cord rather injected; no exudatory corpuscles existed in the cerebellum; in the second, the dura mater was injected, and a little fluid existed in the ventricles and in the spinal canal; the lower part of the cord was red, its grey substance throughout of a dark red.

Of eight cases, in which the patients died exhausted in one,<sup>2</sup> the arachnoid on the sides of the brain was injected, the ventricles contained a little serum, the cerebellum was injected but firm, cord healthy, the heart was large and distended with blood; in a second,<sup>3</sup> the brain was rather more injected than usual, the vessels of the cord dilated and covered on one side by coagulable lymph; in a third,<sup>4</sup> the brain was softened generally, but it was most pronounced in the grey portion, the ventricles contained much fluid, the pia mater was

<sup>1</sup> Myself; Stiebel Jour., für Kinder Krank., 1851.

<sup>2</sup> Rufz.

<sup>3</sup> Prichard.

<sup>4</sup> Babington.



watery, and soft adhesions existed in the arachnoid ; in a fourth,<sup>1</sup> serum existed under the arachnoid, the cortical substance was rather dark, the corpus calosum, septum lucidum and fornix softened, the last pulpy, the cerebellum and medulla oblongata softer than usual, cord as low as fourth cervical vertebra healthy ; in a fifth,<sup>2</sup> the arachnoid was dull, and covered with plastic lymph along the inner margins of the hemispheres, brain with superficial vascular injection, fluid in ventricles, fornix, septum lucidum, walls of ventricles and corpora quadrigemina very soft, the cerebellum and the cord, as far as it could be examined, healthy ; in a sixth,<sup>3</sup> the centrum ovale was more dotted with blood than usual, plexus choroides and velum interpositum, particularly the latter, tinged with blood, vessels on the corpora striata and optic thalami distended and large ; a little fluid existed in the spinal canal, and the theca of the cord was more vascular than usual, with bony plates on its lower half, pia mater more vascular than in health, cord healthy, kidneys mottled, uterus large, the right ovary contained a cyst filled with tenaceous substance, and bony deposit existed at the extremity of the fallopian tubes and on the side of round ligament ; in a seventh,<sup>4</sup> the membranes of the brain and cord were injected, the lining membrane of the womb gorged with blood ; in an eighth,<sup>5</sup> the brain was rather soft, mem-

<sup>1</sup> Ingleby.<sup>2</sup> Romberg.<sup>3</sup> Bright.<sup>4</sup> Elam ; *Prov. Med. and Surg. Jour.*, 1849.<sup>5</sup> Keir ; *Edin. Med. and Surg. Jour.*, vol. xliii.

branes of cord red, partly from congestion and partly from effused blood, the whole cord appeared as if imbedded in blood, the cord was rather soft.

4. *Changes in the brain and cord, with disease of the heart.*—Of thirteen cases which proved fatal, and in which disease of the heart or pericardium was found: in six, death ensued from the severity of the disease; in four, from exhaustion; in two, from convulsions; in one case delirium existed; in one, from paralysis, caused by spinal meningitis.

In the six cases in which death ensued from the severity of the disease; in one,<sup>1</sup> the brain was healthy, the pericardium and the contiguous parts of the lungs inflamed, pericardium adhering to heart by lymph, semi-lunar and mitral valves with recent vegetations; in a second,<sup>2</sup> both cord and brain were healthy, pericardium adhering to heart from old and recent disease, aortic and mitral valves with vegetations, pleuritis, lungs congested; in a third,<sup>3</sup> the ventricles of brain contained six drachms of serum, the pericardium adhered to the heart; in a fourth,<sup>4</sup> serum existed in the ventricles of the brain, the pericardium contained lymph and serum, the heart was hypertrophied, and serum existed in the pleural cavities; in a fifth,<sup>5</sup> the cerebellum was very soft, the pericardium adhered to the heart by soft lymph, heart fatty, mitral and aortic valves with granulations, liver fatty; in a sixth,<sup>6</sup> the cord and brain were

<sup>1</sup> Bright.

<sup>4</sup> See.

<sup>2</sup> Hughes.

<sup>5</sup> Kirkes.

<sup>3</sup> Prichard.

<sup>6</sup> Ormerod.

injected, and vegetations existed on the aortic and mitral valves.

In three of the four cases in which the patients died exhausted: in one,<sup>1</sup> there were vascular points in the centrum ovale and congestion of the choroid plexus, membranes of cord healthy, pericardium thickened, heart covered with lymph, heart healthy but valves covered with granulations; in a second,<sup>2</sup> the brain was healthy, vessels of spinal cord rather large, serous membranes rather opaque, and old adhesions existed particularly at posterior part of medulla oblongata, the pericardium contained five ounces of flaky serum; in a third,<sup>3</sup> the dura mater was injected, and serum existed under the arachnoid and in the ventricles, brain soft, vessels on cord injected, pericardium thickened, containing five ounces of serum and lymph, heart covered with lymph, its substance and valves red.

In one case,<sup>4</sup> in which the patient was delirious, violently convulsed, and passed his motions under him, the veins of the skull and spinal canal were gorged with blood, brain firm, and injected, cord for one inch opposite the third and fourth dorsal vertebræ softened, pericardium adhered to heart, mitral valve fringed with vegetations, lungs congested.

In one case,<sup>5</sup> in which the respiration became obstructed, followed by a slight convulsive fit, and in a

<sup>1</sup> Yong.

<sup>2</sup> Addison, cited by Dr. Babington.

<sup>3</sup> Roeser.

<sup>4</sup> Nairne.

<sup>5</sup> Back, cited by Dr. Babington.



few hours by death, the arachnoid was opaque, pia mater turgid, convolutions red and softened, and the medullary portion marbled with blood-points, the pineal gland contained a watery tumour the size of a grain of wheat, the posterior part of the pituitary gland was soft and granular, the anterior contained a small vesicle, the pericardium adhered to the heart by recent lymph, heart large, mitral valve thickened, pleuritis with effusion of serum existed, and the lungs and bronchial tubes were congested.

5. *Changes in the brain and cord, with disease of the lungs and peritoneum.* — Of five cases which proved fatal in connection with disease of the lungs: in four,<sup>1</sup> from pneumonia, (in two in connection with small-pox), and in one from catarrh and emphysema. In three of the four first cases there was injection of the cerebral arachnoid, in one injection of the pia mater; in three the brain was injected, in one softened in the centre; the cord was examined in three of the cases and was found healthy, but in one its arachnoid was injected. In the case which died from catarrh and emphysema,<sup>2</sup> the patient was seventy years of age, fluid existed between the membranes of the brain, the cerebrum was atrophied, the crura cerebri softened and of a brownish hue.

In a case<sup>3</sup> in which death ensued from peritonitis, the longitudinal sinus contained fibrinous clots, the vessels of the dura mater were injected and slight sub-

<sup>1</sup> Rufz., Green, and See.

<sup>2</sup> Romberg.

<sup>3</sup> Rufz.



arachnoid infiltration existed, and a little serum in the lateral ventricles, the white portion of the brain was a little injected, cord healthy, but its arachnoid membrane was a little injected, tubercles existed in the lungs and in the mesenteric and bronchial glands, sero-purulent fluid in the abdomen, rectum ulcerated, and the fluid from the abdomen escaped through it.

In the chorea electra of Dubini,<sup>1</sup> slight effusion of lymph was found in the arachnoid, in the lateral ventricles, and in the spinal canal. In some cases the white portion of the cord was of a rose colour. In one case in which stupor existed with dry cough, difficult respiration, aptha and diarrhœa, he found sero-purulent infiltration in the centre of the brain, and of the left optic thalamus. In two other cases he found the optic thalamus of the left side of a greyish rose colour. Frua<sup>2</sup> and Pignacca,<sup>3</sup> in the same disease, which is described by the former under the name of *tifo cerebrale convulsivo*, found injection of the pia mater of various degrees of intensity, a little fluid in the ventricles, sometimes injection of the cortical substance of the brain, injection of the white substance and of the pes hypocampi, the cord was generally healthy, lungs the same, heart at times hypertrophied, glands of the intestines injected, and spleen sometimes red and infiltrated. Serres<sup>4</sup> states that he "has almost always found the corpora quadrigemina in a state of inflammation." Of

<sup>1</sup> Annali Univer. di Med., vol. cxvii.

<sup>2</sup> Gazzett. Lombardo., 1853.

<sup>3</sup> Ibid, 1853.

<sup>4</sup> Sceance de l'Academ. de Médecine, 1837.

four cases which he examined, in one there was a fatty tumour on them; in the second they were considerably congested, and blood was effused at the base of the brain; in the third and fourth their whole substance was inflamed, and the inflammation extended to the fourth ventricle. He had, however, seen cases in which no disease of the brain could be discovered.

*Osseous plates in the membranes* have been found by Forgues;<sup>1</sup> by Bazin<sup>2</sup> on the left side of the cerebellum, the brain was injected, and the ventricles contained a little serum, the patient died from pneumonia sixteen days from the first appearance of small-pox; the chorea was much better the day before the premonitory symptoms set in; by Froriep on each side of the longitudinal sinus, with ossification of the basilar artery, the vessels on the surface of the brain were injected, and lymph existed at the base of the brain.

*Chronic inflammation of the membranes of the brain* has been observed by Soemmering, Addison<sup>3</sup> and Lelut.<sup>4</sup>

*Tubercles and Tumours.*—Of the pineal gland by Brodie;<sup>5</sup> on the cerebellum by Andral;<sup>6</sup> in the brain by Georget, Pedangle,<sup>7</sup> Headington,<sup>8</sup> Andral,<sup>9</sup> Guersent,<sup>10</sup> and See. A case has been recorded in the "Journale de Progress" for 1830,<sup>11</sup> and one in the "Medico-Chirurgical Review" for 1839.

<sup>1</sup> See.<sup>2</sup> Thèse. de Paris, 1834, Obs. 1.<sup>3</sup> Webster.<sup>4</sup> See.<sup>5</sup> Webster.<sup>6</sup> See.<sup>7</sup> Jour. de Majendie, tome vi.<sup>8</sup> See.<sup>9</sup> Leçons Orales, and See.<sup>10</sup> Rufz.<sup>11</sup> See.

Monod<sup>1</sup> found in two cases hypertrophy of the cortical substance of the brain and cord. I have seen rhythmic movements in a case in which induration of the brain and cord was found.<sup>2</sup> Hutin<sup>3</sup> found atrophy of the cerebellum, with hypertrophy of the cord. Bergamaschi,<sup>4</sup> induration of the cord. Petiet,<sup>5</sup> softening of the cerebellum; Serres,<sup>6</sup> abscess and apoplexy.

*Cord.*—Gendrin<sup>7</sup> has seen general softening of the cord, and Rilliet and Barthez slight. Guersent,<sup>8</sup> softening of the cervical portion, and Webster of the lower part.

#### GENERAL SYMPTOMS OF CHOREA.

De Hane, Gardane,<sup>9</sup> Baumes,<sup>10</sup> Ewart,<sup>11</sup> Springle, Vogel, Frank,<sup>12</sup> Rufz, Blache and See, consider that the left side of the body is more liable to the disease than the right. Of twenty-five cases observed by Rufz: in nine the disease was general, but in two it was most pronounced on the left; in five both the superior extremities were affected; in five the left superior and inferior extremity; in one the right superior and inferior extremity.

Of fourteen observed by Blache: in seven the disease was general, but most pronounced on the left side; in five on the left side, and two on the right. See states

<sup>1</sup> Blache.

<sup>2</sup> See page 103.

<sup>3</sup> Biblioth. Médicale, 1828, obs. 6.

<sup>4</sup> Sulla Mieleto Stenicae Sul Tetano.

<sup>5</sup> Majendie's Journal, tome vi.

<sup>6</sup> Ibid, 1823.

<sup>7</sup> See.

<sup>8</sup> Rufz.

<sup>9</sup> Pinel: Nosographie, tome iii.

<sup>10</sup> Convulsions des Enfants, 1805.

<sup>11</sup> Pinel.

<sup>12</sup> Wilhelm: Diss. de Chorea, Lips, 1825.

that the disease was most marked on the left side in ninety-seven out of 154 cases.

Wicke, however, states that out of 149 cases, in ninety-one the disease was general, in twenty-six it affected the right side, and in twenty-three the left. From my own observations, and from the cases I have collected, the disease seems to be quite as liable to occur in one side of the body as the other.

The following table will show the position of the disease in 200 cases :—

It affected the whole or nearly the whole

body .....	in 98 cases.
The head .....	„ 14 „
„ head and arms .....	„ 3 „
„ face .....	„ 12 „
„ face and arms or hands .....	„ 6 „
„ arms, both .....	3
right .....	4
left .....	4
not stated ...	4
} .....	
„ arms and neck .....	„ 3 „
„ trunk .....	„ 3 „
„ side of the body, right .....	12
left .....	10
not stated ...	4
} ...	
„ legs, both ...	5
right ...	8
left ...	7
} .....	
„ 20 „	
200	



I. *General Chorea*.—The disease may occur under two forms : First, as *mild or common*, and secondly, as *severe*. In the mild or common form the disease is constant, except when the patient is asleep, when it generally ceases or diminishes in severity ; but in the severe form it occurs in paroxysms of variable duration. In the *common form*, the disease commences with tremblings or agitations, which sometimes increase in severity, and assume a convulsive character.

In some cases, and particularly those in which it occurs in connection with inflammation of the organs of the chest or abdomen, or fevers, or cerebral excitement, the agitations may be general, or nearly so, from the commencement, and become in the course of six, twelve, twenty-four, or thirty-six hours, very severe ; but in others they remain in the face or arms, generally increasing in severity, for several days or even weeks, and then appear in some other part of the body. Generally, the motions commence in one arm, then in the half of the body and leg of the same side, then in the opposite arm, side of the body, and leg. In some cases they commence in the face, extending, if one side of it is affected, first to the arm, then to the half of the body and leg of the same side, then to the opposite side ; but if the whole of the face is affected, the motions generally extend to both arms, and then to the rest of the body ; but in others the face does not become affected until after the arm, the side of the body, both arms, or the trunk and extremities.

In the legs, the affection shows itself by great feeble-

ness, approaching to paralysis, which is generally more marked in one leg than in the other. The legs, although feeble and trembling and the feet dragging, are, when an effort is made to walk, either jerked suddenly and involuntarily forward, in an irregular manner, or suddenly flexed, the foot being raised twice or thrice as high as usual and then suddenly extended, the patient making but little progress. In some cases the feet are more affected than the legs, and they are either dragged in a jerking manner over the ground, violently twisted before leaving or after reaching the ground, or while raised.

In the arms it also shows itself by great feebleness, approaching to paralysis, with agitations or convulsive jerks. In some cases they are suddenly extended and retracted, the hands being sometimes supinated and pronated, or carried against the chest, shoulder, or towards the back of the head; in others they remain more or less rigid and extended, carried backwards or forwards in a kind of swinging manner, separated from the body, and then brought back or rotated at the shoulder-joint. In some cases the patients have not the power of reaching objects or conveying them to the mouth, either from rigidity or feebleness; but in others there is no loss of power, but, from the occurrence of sudden extension, the hands are carried beyond the object, and in conveying it to the mouth, from the occurrence of sudden flexion it is often jerked over the head or shoulders.

In the face, the muscles of the mouth, cheeks, nose, eyelids, eyes and forehead, are alternately contracted and

relaxed. The muscles of the lower jaw are sometimes affected, the jaw being incessantly opened and shut, or the teeth grated against those of the upper, generally in one direction ; sometimes those of the tongue, the organ being either suddenly protruded and retracted, or thrown from side to side in the mouth, the patient being unable to protrude it. The speech in these cases is generally more or less indistinct ; sometimes the patients can only succeed in uttering a few words by fixing the tongue between the teeth, or with the finger and thumb. Sometimes the muscles of the pharynx become affected, and deglutition is rendered more or less difficult, and sometimes the diaphragm, the patient suffering from distressing hiccough, sobbing or noisy inspiration. In one case which fell under my observation, the patient suffered severely from hiccough and reaching. They sometimes suffer from involuntary fits of laughter. The face, particularly when the disease is severe and existed for some time, often becomes dull and heavy, or assumes an idiotic expression ; the memory sometimes fails, and the sight and hearing become dull.

Headache is frequently observed, and occasionally delirium, particularly at night, pain in the back, and, in females, in the inguinal and hypogastric regions. The motions generally cease during sleep, but sometimes they continue, but much diminished in severity ; in some cases they are very severe just as the patient is falling asleep. The skin is generally cool and harsh ; the pulse sometimes but little altered, sometimes quick and feeble ; the urine natural, pale and watery, or loaded with

phosphates, the bowels are generally confined and the motions often dark-coloured and fœtid.

The disease frequently affects some parts of the body more than others, generally the arm and leg of one side; sometimes one of the legs, the face, or the tongue, remains unaffected. The disease generally becomes worse towards night, after exertion, and during mental emotion. The motions sometimes increase in severity, and become so severe that the patient can only be retained in bed by force. In these cases the patients often emaciate rapidly and sink from exhaustion.

In the *severer form* the convulsions occur in paroxysms of variable duration and severity. This form is the *chorea saltans*, *chorea procursiva vel festinans*, or *chorea insaniens* of the old writers; the *grosses veitz tanze* of the Germans, the *grande danse de Saint Guy* of the French, and the *leaping ague* of the Scotch.

The accesses are generally preceded by pains in the head, back, and sometimes in the inguinal and hypogastric regions, or palpitation of the heart, constriction of the lower part of the chest, difficulty of breathing, violent hiccough and sobbing, or great restlessness, with or without delirium. These are often followed by insensibility or catalepsy of short duration. Then the patients begin to dance, throw their arms about, vociferate, leap on and over the furniture, across the room, generally on the feet, but sometimes on the hands and feet, and roll first in one direction until an obstruction is met with, then in an opposite one until obstructed, when they roll back again; sometimes there is a strong ten-



dency to roll only in one direction. The body is rigid and extended, the arms fixed to the side. Sometimes the patients gather themselves into a ball and roll over and over until they meet with an obstruction, when they begin a new set of motions ; sometimes they attempt to stand on their heads and turn the body round upon it ; sometimes they stand erect, the whole body being rigid, and turn round with great velocity ; sometimes they sit and turn round ; sometimes they bow the body forward until only the forehead and toes touch the ground, or backward until the head nearly touches ; sometimes they climb up the doors, rafters, or bed furniture ; sometimes they run with great velocity until they meet with an obstruction, or reach some point fixed in their minds, when they fall down exhausted. In some cases the most prominent symptom is the leaping or dancing ; in others the dancing, climbing and tumbling. The patients seldom continue one set of motions for any length of time, except the rotation of the body and the running, the former sometimes lasts for several hours, the latter until the patients sink exhausted or meet with an obstruction. The duration of the paroxysms of leaping and dancing or rotation varied. In one case the patient<sup>1</sup> became maniacal and danced until death ; in a second<sup>2</sup> and third,<sup>3</sup> the paroxysms continued from morning to night, in one case they were slight in the morning, but severe towards night ; in a fourth,<sup>4</sup> fourteen or fifteen

<sup>1</sup> Plater: *Obs. Med.*, 1641.    <sup>2</sup> Crüger: *Emph. Nat. Cur.*, 1690.

<sup>3</sup> Dewar: *Edin. Med. and Surg. Jour.*, vol. lii.

<sup>4</sup> Kennedy ; *Ibid*, vol. i.

accesses occurred between eight in the morning and twelve at night ; in a fifth,<sup>1</sup> four occurred in the course of the day, each lasting about two hours ; in a sixth,<sup>2</sup> five ; in a seventh,<sup>3</sup> several ; in an eighth,<sup>4</sup> ninth,<sup>5</sup> and tenth,<sup>6</sup> only one : in one case the access occurred in the morning, at first it lasted two hours, but afterwards six or seven ; in the second, in the middle of the day, and lasted about one hour ; in the third, in the evening. In three cases,<sup>7</sup> two sisters and a brother, several weeks elapsed between the attacks, which were of short duration ; they were followed by paralysis of the lower extremities, and loss of speech for several days.

The duration of the paroxysms of running also varied. In a case observed by Tulpius,<sup>8</sup> the patient ran until exhausted ; in one by Andree,<sup>9</sup> until an obstacle was met with, when she fell struggling, and then lay still. In the synopses of Angus and Mearns, the patients often ran to some point fixed in their minds, when they fell exhausted ; and Pedangle<sup>10</sup> has recorded the case of a man who walked in an agitated manner until exhausted ; Sogar,<sup>11</sup> Bernt and Majendie,<sup>12</sup> patients who could not avoid obstacles. In Majendie's case, the patient some-

<sup>1</sup> Kinder Wood : *Medico-Chir. Trans.*, vol. vii.

<sup>2</sup> Hunter : *Edin. Med. and Surg. Jour.*, vol. xxiii.

<sup>3</sup> *Ibid.* vol. iii.      <sup>4</sup> Powel : *Medical Transactions*, vol. iv.

<sup>5</sup> Watt. *Medico-Chir. Trans.*, vol. iv.

<sup>6</sup> Crichton : *Edin. Med. and Surg. Jour.*, vol. xxxi.

<sup>7</sup> Armstrong : *Medical Commentaries*, vol. ix.

<sup>8</sup> *Obs. Méd.*

<sup>9</sup> *Medical Cases*, 1746.

<sup>10</sup> *Jour. de Majendie.*

<sup>11</sup> *Syst. Morb.*, 1783.

<sup>12</sup> *Physiologie.*

times walked backwards, he also suffered for several hours at a time from irregular movements, the body being sometimes bent forward, sometimes backwards, or to one side. Petiet<sup>1</sup> and Laurent<sup>2</sup> have each seen a patient who was irresistibly propelled backward.

*Common chorea*, both general and partial, sometimes occurs in accesses. Metius<sup>3</sup> has seen it occur daily at irregular periods, and sometimes during the night; Hamilton<sup>4</sup> at intervals of two or three hours, lasting from ten minutes to an hour; Richards<sup>5</sup> several times a day; Thompson<sup>6</sup> twice in the twenty-four hours; Bouteille and Rufz from noon to 6 P.M.; Elliotson<sup>7</sup> in the morning; Duncan<sup>8</sup> in the evening and after going to bed; Ingleby daily; Lentilius<sup>9</sup> irregularly; Mercklin<sup>10</sup> periodically; Dedier<sup>11</sup> every other day; Crampton<sup>12</sup> at intervals of three or four days. A case is recorded in the "Annals of Medicine" for 1799, in which the accesses occurred at intervals of fourteen and twenty-one days.

II.—*Partial Chorea*.—1. *Of one of the sides of the body*.—The motions sometimes commence in the face, but more frequently in the arm, extending to the same side of the face and the body. The disease has been observed to pass from one side of the body to the

<sup>1</sup> Jour. de Physiologie.

<sup>2</sup> Majendie.

<sup>3</sup> Emph : Nat. Cur., Dec. iii. and iv.

<sup>4</sup> On Purgatives.

<sup>5</sup> Med. and Phys. Jour., vol. i.

<sup>6</sup> Lancet, 1841-2.

<sup>7</sup> Lancet.

<sup>8</sup> Edin. Med. and Surg. Jour., vol. lxxxi.

<sup>9</sup> Miscell. Cur. Dec. ii. an 2.

<sup>10</sup> Emph : Nat. Car., 1697-8.

<sup>11</sup> Sauvages, tome i., 592.

<sup>12</sup> Trans. of King's and Queen's College, vol. iv.

other by Wagner,<sup>1</sup> Stalpart Van der Weil<sup>2</sup> and McMullin. In all the cases it passed from the left to the right side.

2. *Of the Head.*—The head is sometimes rotated from left to right and right to left, sometimes jerked from side to side, or only to one side; sometimes it is drawn backwards, the occiput resting against the nape of the neck: in two cases, one recorded in the *Emphe-merides*, the other by Dr. White,<sup>3</sup> it was also rotated. In some cases the motions are rhythmical, in others irregular. Sometimes they are constant, sometimes they exist only during the day, or occur in the evening, when the patient is fatigued or excited. In a case observed by Mercklin,<sup>4</sup> the rotations continued day and night for six weeks; in one by Sir Charles Bell, they were constant, the head rotating twenty-two times in a minute; in one by Dr. Paget,<sup>5</sup> they continued during the day and sometimes during the night. In one case observed by Sir Charles Bell, the motions were arrested when the patient looked upwards; in one by Dr. Paget, by leaning the head against the wall,—fixing the attention, and mental emotion checked them for an instant. In a case observed by myself, the motions occurred towards night and continued, but diminished in severity, for a short time after going to bed; in another case, the motions

<sup>1</sup> Miscel. Cur., Dec. iii., an. ii.

<sup>2</sup> Obs. Med., 1724, 75.

<sup>3</sup> Medical Commentaries, vol. iv.

<sup>4</sup> Emph: Nat. Cur., 1694.

<sup>5</sup> Edin. Med. and Surg. Jour., vol. xlvii.



only occurred when the patient was fatigued or excited; they did not continue more than ten or fifteen minutes. In a case recorded by Serres, the head was rotated after drinking. The motions are not always confined to the head, the muscles of the face being frequently affected. In the case recorded in the *Emphemerides* and by Dr. White, the body was also affected; in one observed by Mr. Bree,<sup>1</sup> the body sometimes assumed a rotatory motion; in the case observed by myself, the body, if the exertion was continued, had a tendency to rotate. In a case recorded by Dr. Paget, the muscles of the fore part of the body were seized with sudden contractions, by which the legs were tossed over the head every ten minutes.

3. *Of the Face.*—The whole of the muscles are sometimes affected, sometimes only one set, or those of one side. The motions may be either constant or occur only during mental emotion. They have been observed by Plater in one side of the face during a pustular eruption; in the muscles of the jaw by Mr. Calaway, after dislocation of the jaw; from teething by Messrs. Bailly and Meyraux: in this case they extended to the shoulder of the same side. The motions are not always confined to the face. I have seen them occur in three cases with distressing hiccough and noisy inspiration, and in one with motions of the feet. Dr. Addison has observed it exist at the same time in the muscles of the neck; Dr. Kirks in the arms; Mr. Franklyn<sup>2</sup> in the hands, and Dr. Babington in one hand. In one case

<sup>1</sup> *Lancet*, 1834-5.

<sup>2</sup> *Medical and Physical Journal*, vol. xxxiii.

recorded by Dr. Addison, the chorea left the face and appeared in the arm where it continued.

4. *Of the Body*.—The body is rarely affected without the extremities being implicated. The motions may be either bowing or rotating, or from right to left and left to right, or the shoulders drawn backwards, from the muscles of the back being affected.

5. *Of the Arms*.—Both arms are seldom affected, without the face, body, or lower extremities being implicated. Of three cases: in one<sup>1</sup> the patient struck the thighs, first with one hand, then the other; in a second,<sup>2</sup> they were carried to the face, forehead, and back of the head, the face became subsequently affected; in a third,<sup>3</sup> both were affected with tremblings, the right one more severely than the left; sometimes they were suddenly crossed in front of the body and then suddenly separated.

6. *Of the Legs*.—Both legs are frequently affected without any other part of the body being implicated. They are not always equally implicated, or at the same time, one being often convulsed for some time before the other becomes affected. The convulsions generally occur or are most marked when the patients attempt to walk, but they sometimes occur when sitting. Thermaier<sup>4</sup> met with a case, they ceased for a short time when the patient stood up; and Delarive<sup>5</sup> and Belhomme<sup>6</sup> similar cases, but the patients were quite free when in the erect position.

<sup>1</sup> Tulpius.

<sup>2</sup> Rufz.

<sup>3</sup> Myself.

<sup>4</sup> Bernt. <sup>5</sup> Medical and Physical Journal, vol. i. <sup>6</sup> See.

## ALTERNATING CHOREA.

Morgagni<sup>1</sup> mentions the case of a lad, aged eight, in whom the disease (after affecting different parts of the body) settled in the hand, and if the motions were arrested the opposite hand became affected; Adolph,<sup>2</sup> one in which it passed from the legs to the eyes and eyelids, and then back to the legs; Dr. White, from the face and head to one arm, then to the other, and lastly to one or both legs; Dr. Powel,<sup>3</sup> a case in which sometimes both arms and shoulders, sometimes the trunk and arms were affected; occasionally the patient became blind. In the case recorded in the "Annals of Medicine" for 1799, the motions passed from the head to the right arm, then to the right leg, and then back to the head; and in the one by Dr. Crampton, the hands and legs were affected, sometimes one, sometimes all; if the part convulsed was held the motions commenced in another. In the case observed by Mr. Hunter, the motions sometimes ceased in the head, then one or more of the extremities were effected, and if any attempt was made to stop them, they commenced in the head; in one by Dr. Paget, the patient had bowing motions when erect, followed soon after she sat down by motions of the legs.

## DURATION AND TERMINATION.

The duration of chorea varies. Much will depend on its severity, the time it has existed before recourse is had to treatment, and the treatment and regimen adopted.

<sup>1</sup> De Sed. et Caus. Morb., Epis., Art x., 16.

<sup>2</sup> Emph : Nat. Cur., 1715.    <sup>3</sup> Medical Transactions, vol. v

Some cases do not last more than from seven to fourteen days, others four, five, six, seven and eight weeks, while others again are extremely obstinate. It sometimes lasts for some years, occasionally for life, though generally in a mitigated or partial form. It is very liable to return, particularly at the same period of the year, or if the health is reduced. It frequently returns twice, and occasionally three or four times. Rilliet and Barthez have seen it do so six times. In a case brought under my notice by Mr. Lillie, the patient had suffered eight or nine successive summers.

It very rarely terminates fatally ; when it does, it is either in consequence of the existence of some disease in itself fatal, such as carditis, pericarditis, metritis, peritonitis or pneumonia, or from exhaustion and emaciation or from coma or convulsions.

It has been known to disappear on the occurrence of fever or the eruption of measles or small-pox, eruptions of the scalp or body, menstrual discharge, or obstinate diarrhœa.

#### TREATMENT.

Pilgrimages and incantations seem to have been the first means used to cure this disease ; later, herbs, particularly the house leek and wild valerian, bleeding, emetics, purgatives, scarifications and cauterizations of the affected parts, Peruvian bark, camphor, belladonna, musk, castor assafoetida, oil of dippel, cold and warm baths, mercury, antimony, flowers of zinc, the salts of copper or iron, and electricity.



The remedies chiefly employed by modern practitioners are the sulphate and oxide of zinc, sulphate and oxide of iron, sulphate and ammoniated sulphate of copper, nitrate of silver, solution of arsenite of potash, strychnine, cold, plunge or shower baths, blisters to the nape of the neck, counter-irritation to the spine or scalp, and electro-galvanism. It generally yields readily to treatment, but sometimes it is extremely obstinate, baffling every remedy employed.

The following is the plan of treatment I have generally adopted, in the uncomplicated form of the disease, and with marked benefit: First, after clearing out the bowels and bringing the secretions into a healthy state, I give one or other of the preparations of iron with the solution of arsenite of potash, in large doses, after food, three or four times a day. The salts of iron enable the system to bear larger doses of arsenic without inducing unpleasant symptoms than when given alone. Secondly, nourishing diet and cod liver oil. Thirdly, sponging the body with tepid or cold bay salt and water every morning. Fourthly, avoiding mental or bodily exertion, and everything likely to aggravate the symptoms. If these measures fail to make an impression on the disease in the course of a week or ten days, I then employ counter-irritation to the spine, and produce a crop of eruption with croton oil and acetum cantharides mixed with olive oil. In two obstinate cases of chorea—one of the legs, the other of the left arm—the actual cautery over the sacral plexors in the former and over the brachial in the latter, was followed by immediate and

permanent relief. When the convulsions are severe, preventing the patient from sleeping, chloroform may be either inhaled, or given by mouth, in doses of from ten to thirty or forty minims.

When the disease occurs during inflammation of any of the viscera, the treatment must be directed to the organ. It seems necessary, however, not to use a too active plan of treatment, from the patients being apt to sink, often rather suddenly.

In pregnancy the disease is often very obstinate, resisting every measure employed. It always ceases either immediately or in a few hours after the expulsion of the foetus. Therefore, in very obstinate cases, the practitioner may induce premature labour, and feel certain of its removing the disease.

## CHAPTER X.

## TETANUS.

VARIETIES.—1. *Traumatic.* 2. *Idiopathic.*

## CAUSES.

1. *Influence of sex and age.*—Males are from five to nine times more liable to his disease than females, from their being more exposed to atmospheric changes and injuries. Of 1,109 deaths registered in England during eight years, from 1848 to 1855, 707 of the number were males; of 305 in Ireland, from June 1841 to March 1851, 210.

From the following table of the mortality in England, the deaths were more numerous among females in some years than in others.

	1848	1849	1850	1851	1852	1853	1854	1855
Males.....	94	100	73	77	90	82	93	98
Females...	37	33	35	41	53	55	87	55
Total .....	131	133	108	118	143	137	180	153

The mortality is more equal in the first twelve months of life than at any other period, for out of 195 cases registered in England under one year, from 1848 to 1854 inclusive, there were 91 females to 104 males.

Of fifty cases which occurred in the Glasgow Royal Infirmary,<sup>1</sup> from 1794 to the first six months of 1853, forty of the number were males; of seventy-two in

<sup>1</sup> Glasgow Quarterly Medical Journal, October 1853, and January 1854.

Guy's Hospital,<sup>1</sup> from 1825 to 1857, sixty ; of 328 which I have collected from English, French, German and Italian sources, including eight which have fallen under my own notice, 298. Of fifteen cases which Dr. Jackson<sup>2</sup> observed in the Native Hospital at Calcutta, twelve of the number were males.

It may occur at any period of life ; it is however, most frequently observed from the thirteenth to the thirty-fifth year ; but, according to the mortality reports of England and Ireland, it is more liable to occur, or at least to prove fatal, during the first five years of life than at any other.

Under the form of *trismus* it sometimes rages as an epidemic among the young children of some towns, and as an endemic in some European Lying-in Institutions, and on some plantations among the children of the slaves, during the first fourteen days of life.

It occurred as an epidemic in 1758<sup>3</sup> in Heilbron, among children from three to five years of age ; in 1763,<sup>4</sup> in Noyes in Burgundy ; in the month of March 1802<sup>5</sup> at Fuld ; in 1834, at Stockholm. It was frequent at Fuld, (for one midwife met with sixty cases in nine years) ; in Paris, and, according to Dr. James Clark,<sup>6</sup> in Switzerland and the Highlands of Scotland, Madier<sup>7</sup> in Vivarais, and Romberg, in the South of Germany.

<sup>1</sup> Guy's Hospital Reports, 1857.

<sup>2</sup> Indian Annals of Medicine, 1854.

<sup>3</sup> Weber : cited by Ozanam, *Malad Epidemique*, tome iv.

<sup>4</sup> Chaussier.      <sup>5</sup> Schneider : *Ueber Kindbachen Krampf*.

<sup>6</sup> On Yellow Fever.

<sup>7</sup> Dazille, *Maladies Nègres*, 2nd Ed., Paris, 1792.



In the Lying-in Hospital in Dublin in 1782,<sup>1</sup> of 17,650 children born, 2944 (17 per cent.) died in the first fourteen days ; but later, on the establishment of a system of ventilation, of 8,033 born, only 419 (5 or 6 per cent.). During the seven years that Dr. Collins was master only thirty-seven deaths occurred, fourteen during the first year, seven during the second, and in the remaining years three and four. Ozanam states that a large number of newly-born children died annually from it, in St. Catherine's Hospital at Milan.

Bajon<sup>2</sup> observes that it was frequent at Martinique, Guadeloupe, St. Domingo and Cayenne, particularly at the last-named place. Marshall at Ceylon, and Campet at Surinam and Brazil.

According to Dazille, it was more common in the French than in the English colonies. Drs. Clark, Evans and Dancer<sup>3</sup> state that it is frequent in Jamaica and the West Indies, Dr. Chalmers in Carolina, and Dr. Wootton<sup>4</sup> in the cotton plantations of Alabama. It is, observes Dr. Winterbottom,<sup>5</sup> unknown among the native Africans, and, according to Bajon, among the *Indigènes*. Neither Dr. M'William, in his "Medical History of the Expedition to the Niger," nor Dr. Daniell in his "Medical Sketches and Topography and Native Diseases of the Gulf of Guinea" mention the disease. Dr. Winterbottom states that it carried off a

<sup>1</sup> Dr. Clark's Trans. of Royal Irish Academy, cited by Dr. Collins, Pract. Treat. on Midwifery.

<sup>2</sup> Jour. de Méd. Chir. et Pharmacie, 1769.

<sup>3</sup> Jamaica Practice of Physic, 1806.

<sup>4</sup> Cited by Dr. Churchill : Diseases of Children.

<sup>5</sup> Native Africans of Sierra Leone. 1803.

quarter of the negro children ; Bajon and Dr. Dancer a large number, and Dr. Wooton more than any other disease. Bajon, Dancer, Thompson,<sup>1</sup> and other writers state, that on some plantations the disease was very prevalent, while on others in the immediate vicinity no cases, or but very few, occurred.

The first writer remarks that it was very common on the plantations situated near the sea, and on elevated situations exposed to the sea breeze. On a plantation, protected from the sea breeze by a large wood, the disease never occurred, but after cutting it down all the children born became affected. Dr. Chisholm considered that it was caused by cold and impure air ; Dr. Dancer, from the huts being situated in bleak damp situations. The latter observes that delivering the women in lying-in hospitals, where strict attention was paid to cleanliness and warmth, greatly diminished if it did not completely check the disease ; and Dr. James Clark, that the children born in large huts recovered, and that the white children, from the accommodation being more extensive, escaped ; and Dazille, that the children of the whites escape, from being better lodged. In Vivarais, although the climate is warm, it becomes very cold when the north-west wind blows.

Table showing the sex and age of forty seven cases contained in Dr. Laurie's Paper ; of 328 collected by myself ; and the mortality in London for seven years, from 1845 to 1851 inclusive ; and Ireland, from June 1841 to March 1851, for fourteen periods of life :—

<sup>1</sup> Edin. Medical and Surgical Journal, vol. xviii.

	MALES.				FEMALES.			
	Dr. Laurie.	Myself.	London.	Ireland.	Dr. Laurie.	Myself.	London.	Ireland.
Under 5 and 5 years.	0	2	28	75	0	2	17	45
From 5 to 10 "	2	12	5	10	1	5	2	2
" 10 " 15 "	3	44	4	19	0	3	4	7
" 15 " 20 "	7	40	5	17	2	3	2	5
" 20 " 25 "	1	58	9	15	1	3	2	3
" 25 " 30 "	11	52	7	8	0	2	3	5
" 30 " 35 "	2	26	7	9	2	3	1	6
" 35 " 40 "	4	10	6	10	1	2	0	3
" 40 " 45 "	1	16	9	11	0	3	1	3
" 45 " 50 "	4	16	3	7	0	1	3	2
" 50 " 55 "	3	8	2	7	0	1	1	5
" 55 " 60 "	0	4	2	3	0	1	3	0
" 60 " 55 "	0	4	0	5	0	1	1	3
Beyond .....	0	6	2	4	0	0	0	1
Total .....	38	298	89	200	7	30	40	90

Table showing the ages and sex of seventy-two cases given by Mr. Poland : of the deaths in England for seven years, from 1848 to 1854 inclusive, for ten periods of life :—

	MALES.		FEMALES.	
	Mr. Poland.	England.	Mr. Poland.	England.
Under 5 and 5 years.	0	144	0	107
From 5 to 10 "	2	58	3	13
" 10 " 15 "	13	98	3	41
" 15 " 25 "	10	73	3	32
" 25 " 35 "	17	74	2	32
" 35 " 45 "	9	65	1	20
" 45 " 55 "	5	50	0	25
" 55 " 65 "	3	31	0	29
" 65 " 75 "	1	16	0	18
Beyond .....	0	1	0	3
Total .....	60	610	12	320

Of 166 cases collected by Mr. Peet<sup>1</sup>—

6	were between .....	5 and 9 years.
12	„ .....	9 „ 15 „
46	„ .....	15 „ 35 „
63	„ .....	25 „ 35 „
30	„ .....	35 „ 45 „
3	„ .....	45 „ 55 „
6	„ .....	55 „ 65 „
<hr/>		
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2. *Influence of climate*.—In England from 108 to 180 deaths are registered annually from this disease; in Ireland from fourteen to forty-two.

The mortality from all diseases in the former was in 1850, 368,602, from tetanus, 108, being one in 3412; the latter, 164,093, being one in 5,469.

I am not acquainted with any data from which the observer can draw any conclusions as to the relative mortality between tetanus and other diseases in the different European states; but, from the examination of the reports of the sickness and mortality of the troops stationed in different parts of the world, of the bills of mortality of towns, and records of institutions in this country, United States, East and West Indies, some deductions may be drawn.

(1st.) *Among the troops*.—From the following table of the number of cases of all diseases and deaths, or deaths alone, at sixty-eight stations in different parts of the

<sup>1</sup> Bombay Med. and Physical Transactions, 1851-2.



world. It will be seen that the United Kingdom, Gibraltar, Malta, Ionian Isles, Bermudas, Cape of Good Hope, Mauritius, Windward and Leeward Command, British Guiana, Trinidad, Jamaica, St. Vincent, Barbadoes, St. Lucia, Dominica, Antigua, Montserrat and Ceylon, are those at which the disease is most frequently observed. In India, particularly at Bombay, Calcutta and Madras, although the disease is frequent, yet the troops, both European and native, and the civil Europeans and natives, are nearly if not altogether exempt from it. At St. Helena, although no cases occurred among the troops in garrison there, yet out of 552 deaths which ensued among the rest of the population during seven years three were from tetanus. At Malta, however, the reverse seems to have been the case; for, although several cases occurred among the English troops and Malta Fencibles, yet no death was registered among the civil population from 1822 to 1834 inclusive.

The black troops, from the returns from Trinidad, Jamaica, Tobago, Barbadoes, St. Lucia, Dominica, Antigua, Windward and Leeward Command and Ceylon, suffered more frequently than the European, and it was more fatal among them. Thus, out of 20,612 deaths which ensued among the latter, only forty-eight were from this disease; while, out of 4,767 which ensued among the former, forty-six were from tetanus. At New Orleans the deaths from this disease compared with those from other diseases were more numerous among the black than the white population.

TABLE SHOWING THE MORTALITY AMONG THE TROOPS IN DIFFERENT PARTS OF THE WORLD.

STATIONS.	YEARS.	No. of cases of Tetanus treated.	No. of deaths from Tetanus.	No. of cases of all diseases treated.	No. of deaths from all diseases.
<b>UNITED KINGDOM—</b>					
Dragoons and Dragoon Guards ...	{ 1830, to 1836 inclusive of four months of 1837 <sup>1</sup>	4	1	41,464	627
Ditto .....	1837 to 1849 <sup>2</sup> in.	1	1	52,286	677
Foot Guards .....	{ Jan. 1st 1830 to Mar. 31st 1837	—	1	—	745
Ditto .....	1837 to 1846 in.	—	—	—	—
Infantry of the Line	1837 to 1846	2	1	167,145	2,683
<b>MEDITERRANEAN—</b>					
Gibraltar .....	1818 to 1836 in.	3	—	58,227	1,291
Ditto .....	1837 to 1846 in.	1	1	31,101	867
Malta .....	1817 to 1836 in.	5	—	56,369	665
Ditto .....	1837 to 1848 in.	—	—	—	—
Malta Fencibles ...	1841 to 1846 in.	1	1	1,417	28
Ionian Isles .....	1817 to 1836 in.	—	4	—	891
Ditto .....	1836 to 1846 in.	2	—	29,836	406
Corfu and Vido .....	1837 to 1846 in.	1	—	18,413	268
Santa Maura .....	1837 to 1846 in.	1	—	16,40	25
Cephalonia .....	1837 to 1846 in.	—	—	4,009	54
Zante .....	1837 to 1846 in.	—	—	4,190	55
Ithaca .....	1837 to 1846 in.	—	—	589	11
Bermudas .....	1817 to 1836 in.	—	—	15,056	338
Ditto .....	1837 to 1846 in.	2	—	13,343	337
Canada .....	1817 to 1836 in.	—	—	66,957	982
Ditto .....	1831 to 1846 in.	—	—	88,803	1,178
Nova Scotia and New Brunswick .....	"	—	—	24,139	350
Newfoundland .....	"	—	—	2,911	36
<b>Sierra Leone—</b>					
European troops ...	1819 to 1836 <sup>3</sup> in.	—	—	5,489	890
Black " .....	"	1	—	6,157	228
<b>St. Helena—</b>					
Troops .....	{ 1818 to 1820 in. and 1836 & 1837	—	—	4,360	150
Civil and Military population .....	{ 1826 & 1827, & from 1831 to 1835 in.	—	3	—	552
<b>Cape of Good Hope—</b>					
European troops, Cape district .....	{ 1818 to 1836 in.	2	—	22,506	311
Ditto, Frontiers .....	1822 to 1834 in.	—	—	5,740	65

<sup>1</sup> From Army Medical Reports, 1839.<sup>2</sup> Ibid, 1853.<sup>3</sup> Ibid, 1840.

STATIONS.	YEARS.	No. of cases of Tetanus treated.	No. of deaths from Tetanus.	No. of cases of all diseases treated.	No. of deaths from all diseases.
<i>Cape of Good Hope (con.)</i>					
Hottentot troops ...	1822 to 1834 in.	—	—	3,402	45
<i>Mauritius—</i>					
European troops.....	1818 to 1836 in.	3	3	38,108	835
Black " .....	1825 to 1836 in.	—	—	1,170	52
<i>Windward<sup>1</sup> and Leeward Command—</i>					
European troops.....	1817 to 1836 in.	30	20	164,935	6,803
Black " .....	"	17	15	33,557	1,645
<i>British Guiana—</i>					
European troops.....	"	—	6	—	1,485
Black " .....	"	—	—	—	134
<i>Trinidad—</i>					
European troops.....	"	—	—	—	659
Black " .....	"	—	4	—	330
<i>Jamaica—</i>					
European troops.....	"	7	5	93,455	6,254
Black " .....	"	5	5	1,935	172
<i>Bahamas—</i>					
European troops.....	"	—	—	765	107
Black " .....	"	—	—	7,598	290
<i>Tobago—</i>					
European troops.....	"	—	—	—	520
Black " .....	"	—	1	—	71
<i>Grenada—</i>					
European troops.....	"	—	—	—	38
Black " .....	"	—	—	—	54
<i>St. Vincent—</i>					
European troops.....	"	—	5	—	408
Black " .....	"	—	—	—	39
<i>Barbadoes—</i>					
European troops.....	"	—	6	—	1,401
Black " .....	"	—	3	—	411
<i>St. Lucia—</i>					
European troops.....	"	—	1	—	591
Black " .....	"	—	4	—	282
<i>Dominica—</i>					
European troops.....	"	—	—	—	649
Black " .....	"	—	1	—	98
<i>Antigua &amp; Montserrat—</i>					
European troops.....	"	—	2	—	327
Black " .....	"	—	1	—	103
<i>St. Christopher, Tortola and Nevis—</i>					
European troops.....	"	—	—	—	412
Black " .....	"	—	—	—	66

<sup>1</sup> From Army Medical Reports, 1838.

STATIONS.	YEARS.	No. of cases of Tetanus treated.	No. of deaths from Tetanus.	No. of cases of all diseases treated.	No. of deaths from all diseases.
<i>Honduras</i> —					
European troops.....	1817 to 1836 in.	—	—	387	33
Black " " .....	"	—	—	3,839	129
<i>Ceylon</i> <sup>1</sup> —					
European troops ...	1818 to 1836 in.	15	9	72,100	3,000
Malays " " .....	1821 to 1833 in.	10	7	36,550	858
Pioneers (black) ...	1820 to 1836 in.	3	2	24,978	647
Lascars (Europeans)	1821 to 1835 in.	—	—	3,424	39
Lascoryeans (armed)	1816 to 1820	3	2	6,251	116
Negro troops.....		—	1	—	16
<i>Colombo</i> ...					
European troops ...	"	—	2	—	827
<i>Kandy &amp; Kornegalle</i> —					
European troops ...	1820 to 1836 in.	—	—	—	447
<i>Point de Galle</i> —					
European troops ...	"	—	1	—	17
<i>Trincomalee</i> —					
European troops ...	"	—	1	—	442
<i>Badulla and Province of Ouva</i> —					
European troops ...	1820 to 1832 in.	—	—	—	95
<i>Ratnapoona &amp; Province of Saffragam</i> —					
European troops ...	"	—	—	—	28
<i>Tenasserim Provinces</i> —					
Moulmein.....	1827 to 1836 in.	1	1	10,819	305
<i>Tenasserim Coast</i> <sup>2</sup> —					
European troops.....	1834 to 1838 in.	—	—	6,539	194
Native " " .....	"	—	—	3,526	100
<i>Burmese Empire, Rangoon</i> <sup>3</sup> —					
European troops.....	{ 21st April 1824 to 25th March 1825, and 1826 }	—	—	10,646	1,340
18th and 80th Regs. <sup>4</sup>	{ Last War April 1824 to Mar. 1825, and 1826 }	—	—	—	—
<i>Interior of Empire</i> ...		—	—	7,364	712
<i>Malabar and Canara Provinces</i> —					
European troops.....	1829 to 1838 in.	—	—	12,187	300

<sup>1</sup> From Reports of 1841.<sup>2</sup> Madras Army Medical Reports, Presidency Division, 1842.<sup>3</sup> From Reports of 1841.<sup>4</sup> Drs. Taylor and Stewart : Ind. Ann. of Med. Science, 1854.<sup>5</sup> Madras Army Medical Reports, 1844.



STATIONS.	YEARS.	No. of cases of Tetanus treated.	No. of deaths from Tetanus.	No. of cases of all diseases treated.	No. of deaths from all diseases.
<i>Mangalore—</i>					
Native troops.....	1832 to 1841 in.	1	1	7,875	151
<i>Mysore Division—</i>					
European troops.....	1834 to 1838 in.	—	—	13,498	183 <sup>1</sup>
Native ".....	"	—	—	27,085	438
<i>Southern Division<sup>2</sup>—</i>					
European troops.....	1834 to 1838 in.	—	—	8,168	157
Native ".....	"	—	—	23,413	520
<i>Salam—</i>					
Native troops.....	1829 to 1838 in.	—	—	800	64
<i>Coimbatore—</i>					
Native troops.....	1832 to 1838 in.	—	—	563	9
<i>Combacorum—</i>					
Native troops.....	1829 to 1838 in.	—	—	395	8
<i>Madras, Presidency Division<sup>3</sup>—</i>					
European troops.....	1834 to 1838 in.	—	—	9,986	221
Native ".....	1827 to 1838 in.	—	—	12,446	3,344
<i>Northern, Hyderabad &amp; Nagpore Divisions and Eastern Settlements.<sup>4</sup></i>					
<i>Masulipitam—</i>					
Native troops.....	1831 to 1844 in.	1	1	12,175	198
<i>Samulcottah—</i>					
Native troops.....	"	—	—	3,923	78
<i>Vizagapatam—</i>					
Native troops.....	{ 1829 to 1841, exclusive of the first half of 1831-2, and 1841, and second half of 1831 }	3	2	4,091	97
European ".....	1829 to 1841	—	—	2,728	197
<i>Vizianagam—</i>					
Native troops.....	{ 1829 to 1841 exclusive of 1830-31 }	2	2	11,721	281
<i>Chicacole—</i>					
Native troops.....	{ 1830 to 1841 exclusive of 1832-34, and second half of 1833-40 }	1	1	5,483	131

<sup>1</sup> One female died and two children. The number of deaths among the former was 46, among the latter 194.

<sup>2</sup> Madras Army Medical Reports, 1843.

<sup>3</sup> Ibid, 1842.

<sup>4</sup> Ibid, 1844.

STATIONS.	YEARS.	No. of cases of Tetanus treated.	No. of deaths from Tetanus.	No. of all diseases treated.	No. of deaths from all diseases.
<i>Berhampore</i> —					
Native troops .....	{ 1829 to 1841 exclusive of 1831-32 }	2	—	5,704	149
<i>Northern Division</i> —					
European troops.....	1834 to 1838	—	—	3,223	195
Native " .....	"	—	—	56,142	1,442
<i>Hyderabad</i> —					
European troops.....	"	—	—	11,347	399
Native " .....	"	—	—	27,166	655
<i>Nagpore</i> —					
European troops.....	"	—	—	12,376	188
Native " .....	"	—	—	16,554	301
<i>Penang</i> —					
Native troops .....	{ 1831 to 1844, exclusive of 1833 }	—	—	4,355	65
<i>Singapore</i> —					
Native troops .....	1835 to 1841	—	—	3,017	57
<i>Malacca</i> —					
Native troops .....	"	1	1	3,460	117
<i>Ceded Districts</i> <sup>1</sup> —					
European troops.....	1834 to 1838	—	—	9,819	155 <sup>2</sup>
Native " .....	"	—	—	10,083	255
<i>Cuddapah</i> —					
Native troops.....	1829 to 1841	—	—	5,830	123
<i>Kurnool</i> —					
Native troops.....	1840 to 1842	—	—	2,040	37
<i>Cuddalore</i> <sup>3</sup> —					
European troops.....	{ 1829 to 1838, exclusive of 1833 }	—	—	1,369	135
<i>Centre Division</i> —					
European troops.....	1834 to 1838	—	—	11,060	317
Native " .....	"	—	—	17,819	527
<i>China</i> <sup>4</sup> —					
Sepoys.....	1845 to 1847	—	—	5,592	203
<i>Punjab</i> —					
European troops <sup>5</sup> ...	1848-49	2	1	5,173 <sup>6</sup>	—
Native " .....	"	—	—	10,690	—
European troops (Field Hospital) <sup>7</sup>	{ " }	—	—	544	41
Native " (, ) ...	"	—	—	465	49

<sup>1</sup> Report, 1844.<sup>2</sup> One case occurred among the children.<sup>3</sup> Report, 1843.<sup>4</sup> Ibid, 1850.<sup>5</sup> From Dr. Renny, Indian Ann. of Med. Science, 1857.<sup>6</sup> These do not include the cases admitted into the Field Hospital after the different battles.<sup>7</sup> From Dr. McRae, Indian Ann. of Med. Science, 1857.

*In Towns.*—

In *England*.—Birmingham seems to be the town the least liable to tetanus; Leeds and Liverpool the most. In London the mortality varied from one in 2,258 to one in 6,120 of the deaths from all diseases.

In *Scotland and Ireland*.—In Edinburgh and Glasgow the mortality is high, but in Dublin extremely low.

In the *United States*.—In Boston, Baltimore and Philadelphia the mortality is not higher than in England; but in New Orleans it is high both in the white and black population, being about twice as fatal, compared with the mortality from other diseases, among the latter than among the former.

In *Jamaica*.—From the register of deaths in Spanish Town the mortality would seem to be high; for out of 579 deaths registered during four years, two ensued from tetanus.

In *India*.—In *Bombay* the mortality is very high, being nearly twice as great as among the black population of New Orleans.

TABLE SHOWING THE MORTALITY FROM TETANUS AND ALL DISEASES IN TOWNS IN THE UNITED KINGDOM, UNITED STATES, JAMAICA AND INDIA.

	YEARS.	No. of deaths from Tetanus.	No. of deaths from all diseases.
<i>England—</i>			
London .....	1849	24	68,432
	1850	18	48,579
	1851	21	55,354
	1852	24	54,213
	1853	10	61,202
	1854	18	73,697
	1855	24	61,506
	1856	19	56,786
Manchester...	1838	3	8,913
	1839	2	6,774
Liverpool ...	1838	4	8,252
	1839	4	7,435
Leeds .....	1838	2	4,289
Birmingham	1838	—	3,359
	1839	—	3,639
<i>Scotland—</i>			
Glasgow .....	1851 <sup>1</sup>	5	11,829
	1852 <sup>2</sup>	8	12,899
	1853	10	17,537
	9 months 1854	10	12,027
Edinburgh*...	1847	6	6,706
<i>Ireland—</i>			
Dublin .....	1842	14	63,732
	1843	26	70,499
	1844	33	75,055
	1845	28	86,900
	1846	35	122,889
	1847	37	249,335
	1848	30	208,252
	1849	42	240,797
	1850	30	164,093
<i>Jamaica*—</i>			
Spanish Town	1793	—	152 <sup>3</sup> { 94 whites 58 blacks

<sup>1</sup> From Dr. Strang's Mortality of Glasgow, 1855.<sup>2</sup> From Mr. Patrick's Monthly Mortality of Glasgow, 1841 to 1854 inclusive.<sup>3</sup> From Dr. Stark's Mortality of Edinburgh, 1847.<sup>4</sup> From Lempriere's Pract. Obs. on Diseases of the Army in Jamaica, 1799.<sup>5</sup> The tables do not include Jews and non-Christian negroes.



	YEARS.	No. of deaths from Tetanus.	No. of deaths from all diseases.
<i>Jamaica (contd.)</i>			
Spanish Town	1794	—	140 { 94 whites 50 blacks
	1795	2	135 { 84 whites 51 blacks
	1796	—	152 { 98 whites 54 blacks
<i>India—</i>			
Bombay .....	1853	234	13,922
	1854	318	17,742
	1855	346	14,647
	1856	215	15,495
<i>United States—</i>			
New Orleans	1851 <sup>2</sup>	42 whs. 17 blks.	{ Mortality from all diseases 60·6 per 1,000 of population.
Philadelphia <sup>3</sup>	{ 20 years 1807 to 1827	125	{ Mortality from all diseases in 1807 l in 45·52 of pop. 1820 l in 38·25 " 6 in 10,000 deaths
Boston <sup>4</sup> .....	1821 to 1825	3	6 " "
	1826 to 1830	3	4 " "
	1831 to 1835	3	4 " "
	1836 to 1840	6	8 " "
	1841 to 1845	5	5 " "
	1846 to 1848	5	5 " "
Baltimore <sup>5</sup> ...	1836	4	{ The mortality from all diseases was in 1836 l in 42·75 of pop. 1841 l in 46·76 " " 1846 l in 42·45 " " 1848 l in 36·19 " "
	1837	3	
	1838	2	
	1839	3	
	1840	1	
	1841	1	
	1842	5	
	1843	4	
	1844	3	
	1845	1	
	1846	3	
	1847	0	
	1848	0	

<sup>1</sup> From Dr. Leith's Bombay Mortality Reports.<sup>2</sup> From Dr. Stark's Vital Statistics of New Orleans, 1851.<sup>3</sup> From Dr. Wynne, in Report of Commit. of Public Hygiene, 1849, and Dr. Frick; Amer. Jour. of Med. Science, 1855.<sup>4</sup> From Dr. Curtis, in Report of Committee of Public Hygiene.<sup>5</sup> From Emerson's Medical Statistics of Philadelphia.

*In Institutions.*—In *England* the number of cases of tetanus dying in London in the hospitals ranges from eight to twelve, being one in about 200 and 300 of the deaths from all diseases according to the Registrar-General's reports for 1840 and 1841; in Guy's Hospital from one in 100 to 200 and 400. From 1783 to 1794, in St. Thomas', it was 1 in 52 of the deaths from all causes.

*In Scotland and Ireland.*—In Glasgow in 1810 there was one death from tetanus to fifty-two from all causes; in Ireland, both in the Dublin and Belfast hospitals and workhouses the mortality was very low. In all the hospitals in Ireland only sixty-four deaths took place in 68,932 from all diseases, and in the workhouses only twenty-nine in 283,764.

*In the United States.*—In the *Philadelphia Dispensary* the mortality from tetanus was one in 123 of the deaths which occurred during five years from all diseases.

*In Jamaica.* — During four years at the public hospital at Kingston no cases were admitted: the patients were nearly all Europeans.

*In India.*—At *Aden* no cases were admitted, neither in the European nor native hospital.

*Bombay.*—During four years no cases were admitted into the European General Hospital, but into the native and Jamsetjee Jejeebhoy Hospitals a large number. In the former, the deaths were one in seventy-two; in the latter it varied from one in twenty-three to one in forty and forty-eight. In the civil hospital at Poona the deaths were one in sixty-two; in that of the northern division of the Presidency one in twenty-five; and in

that of the southern one in forty-three ; but in that of the Presidency division there were no deaths.

*Calcutta.*—During four years no cases occurred at the Hospital for Seamen ; in the hospital of the Medical College and the native hospital it was frequent. In the former the deaths varied from one in twenty-six to one in thirty-five, and one in 102 of the deaths from all causes.

*Madras.*—No cases occurred among the troops, both European and native, or the civil Europeans and natives, women and children admitted into the Presidency, General Hospital during ten years. In the Hospital of the Medical College the deaths in 1846 were one in 102, and in 1847 one in eighteen of the deaths from all diseases.

TABLE SHOWING THE MORTALITY IN INSTITUTIONS IN LONDON, GLASGOW, IRELAND, PHILADELPHIA, SPANISH TOWN, ADEN, BOMBAY, CALCUTTA AND MADRAS.

	YEARS.	No. of cases of all diseases treated.	No. of deaths from all diseases.	No. of cases of Tetanus treated.	No. of cases died.
<i>London—</i>	{ 1846	3,789	409	4	4
	{ 1847	4,044	384	2	2
	{ 1848	3,772	375	2	2
	{ 1849	3,824	375	4	3
	{ 1850	4,165	347	4	3
Guy's Hospital: ...	{ 1851	4,621	413	3	2
	{ 1852	3,876	342	2	2
	{ 1853	4,172	432	2	1
	{ 1854	4,636	526	5	5
	{ 1855	4,306	404	4	4
	{ 1856	4,615	404	5	3
	In 32 years	113,020	11,052	72	62
St. Thomas's:.....	1783 to 1794	3,835	474	9	—
London Hospitals	{ 1839	—	2,492	—	8
	{ 1840	—	2,358	—	12

<sup>1</sup> Extracted from Mr. Poland's Table of Cases, admitted from 1825 to 1857.

<sup>2</sup> From Sir Gilbert Blane's Select Dissert, 1833.

<sup>3</sup> Registrar-General's Reports, 1840 and 1841.

	YEARS.	No. of cases of all diseases treated.	No. of deaths from all diseases.	No. of cases of Tetanus treated.	No. of cases died.
<i>Ireland</i> —					
Belfast Hospitals	{ from June 1841 to March 1851 }	—	2,388	—	4
Dublin Hospitals	"	—	15,100	—	26
" Workhouses	"	—	11,812	—	2
Hospitals in Ireland	"	—	86,932 <sup>2</sup>	—	64
Workhouses "	"	—	283,764	—	29
<i>Scotland</i> —					
Glasgow Royal Infirmary .....	{ 1810 <sup>3</sup> 1847 <sup>4</sup>	1,057 surg. cases 347	52 —	1 5	— —
<i>United States</i> —		all diseases			
Philadelphia Dispensary <sup>5</sup> .....	{ 1786-87, 1 year 1787-88 " 1788-89 " 1789-90 " 1790-91 "	1,584 1,809 1,844 1,480 1,198	81 89 63 75 62	1 — 1 — 1	1 — 1 — 1
<i>Jamaica</i> —					
Kingstown Public Hospital <sup>6</sup> .....	{ 1793 1794 1795 1796	410 553 306 277	122 223 91 103	— — — —	— — — —
<i>Aden</i> —					
European Hospital	1855	349	12	—	—
Native "	1855	3,822	93	—	—
<i>Bombay</i> —					
European General Hospital .....	{ 1849-50, 1 year 1851-52, 1 year 1852-53, 1 year 1855-56, 1 year <sup>9</sup>	1,117 1,199 1,039 1,068	77 87 46 57	— — — —	— — — —
Native ditto <sup>10</sup>	{ 1838 1845 1846 1847 1848 <sup>11</sup>	1,511 2,920 3,227 3,832 3,532	217 552 572 498 539	5 23 30 30 28	3 12 24 18 21

<sup>1</sup> Census of 1851.<sup>2</sup> This number includes 4,497 deaths from cholera in temporary hospitals in 1849 and 1850.<sup>3</sup> Edin. Med. and Surg. Jour., vol. vii.<sup>4</sup> Dr. Lawrie.<sup>5</sup> Transact. of College of Physicians of Philadelphia, 1793.<sup>6</sup> Lempriere.<sup>7</sup> Dr. Coles : Trans. of Med. and Phys. Soc. of Bombay, 1855-6.<sup>8</sup> Mr. Stovell : Ibid, 1849-50, and 1853-4.<sup>9</sup> Dr. Coles.<sup>10</sup> Dr. McLennan : Ibid, 1840.<sup>11</sup> Mr. Peet : Ibid, 1849-50.



	YEARS.	No. of cases of all diseases treated.	No. of deaths from all diseases.	No. of cases of Tetanus treated.	No. of cases died.
<i>Bombay, (contind.)</i>					
Jamsetjee Jejeebhoy Hospital ...	{ 1855-56 <sup>1</sup> }	5,315	881	—	19
<i>Poona—<sup>2</sup></i>					
Civil Hospital.....	1855-56, 1 year	1,650	125	—	2
<i>Northern Division—</i>					
Civil Hospital.....	"	1,229	51	—	2
<i>Southern Division—</i>					
Civil Hospital. ...	"	900	43	—	1
<i>Presidency Division—</i>					
Civil Hospital.....	"	195	42	—	—
<i>Calcutta—</i>					
Hurrahs Hospital for Seamen <sup>3</sup> ...	{ 1837 1838 1839 1840 }	546 490 726 651	} 7 per cent.	—	—
Medical College <sup>4</sup> ...	{ 1841, 1st May to 30th April 1844 }	4,081		8	6
	{ 1848 1849 1850 1851 1853 }	2,521 2,430 1,091 2,281 2,634	174 216 105 209 241	6 7 3 11 8	4 3 3 8 8
	{ 1847 1848 1849 1850 <sup>6</sup> 1851 <sup>7</sup> }	— — — 2,079 —	— — — — —	4 13 12 18 9	2 9 8 13 7
<i>Madras—</i>					
Presid. Gen. Hos., <sup>8</sup>	{ 1829 to 1838 in. }	3,833	181	—	—
European Troops					
Native "	"	3,366	147	—	—
Civil Europeans ...	"	1,903	126	—	—
" Natives .....	"	677	75	—	—
Females " .....	"	1,065	26	—	—
Children " .....	"	1,788	115	1	—
Medical College <sup>9</sup> ...	{ 1846 1847 }	2,618 2,405	205 183	3 14	2 10

<sup>1</sup> Dr. Coles.<sup>2</sup> Ibid.<sup>3</sup> From Mr. Green, Calcutta Med. and Physical Journal.<sup>4</sup> From Reports of Med. College, 1845 to 1854. <sup>5</sup> From Dr. Jackson.<sup>6</sup> From Report of Native Hospital, 1851.<sup>7</sup> Dr. Jackson.<sup>8</sup> From Madras Army Medical Reports, 1842.<sup>9</sup> Reports of Med. College.

(2.) *In Military and Naval Engagements and Sieges.*—1. *Peninsular campaigns.*—Sir James Macgregor<sup>1</sup> divides them into four periods.

*1st Period.*—1811 and 1812, from December to April. The divisions employed at the siege of Ciudad Rodrigo were very much harassed and but little sheltered from the weather, which was severe, snow falling occasionally; the ground in December, January and February, was covered with hoar-frost. The number of wounded and frost-bites were considerable; "tetanus was not unfrequent." In February the campaign opened and soon afterwards Badajos was besieged. It rained heavily throughout. The wounded amounted to 5,000; "tetanus was not unfrequent."

*2nd Period.*—1812, from June to November. The men were actively employed, exposed to the sun during the day, and sleeping in the open air at night. From June to September the heat was seldom under 90° Fahr. The rains commenced in September and continued until October; the greater part of November was very cold. Tetanus was prevalent in August after the battle of Salamanca, and some cases occurred at the siege of Burgos.

*3rd Period.*—1813, from May to Winter. After the battles of Vittoria and Pampeluna tetanus was more prevalent than it had ever been. The marches were long and harassing, and the men slept in the open air.

<sup>1</sup> Med.-Chir. Transact., vol. vi.

*4th Period.*—1814, February to May. Several cases of tetanus occurred after the battle of Toulouse.

The following is the number of deaths from wounds and tetanus which occurred during 1812, 1813, and 1814. "From the nature of the service on which the troops were sometimes engaged it was not always possible to determine the number of deaths."

	1812.	1813.	1814.	Total.
Deaths from wounds ...	905	1095	699	2699
Deaths from tetanus ...	4	23	24	51

This table is evidently of little value. Dr. O'Beirne<sup>1</sup> observes that 200 cases of tetanus fell under his notice while serving with the artillery. At a rough calculation he considered that it attacked one in 200 of the wounded. Sir James, in speaking of the results of the different plans of treatment adopted, mentions "several hundred cases."

Mr. Alcock in his "Medical History of the British Legion in Spain,"<sup>2</sup> states that the average number of cases of tetanus was one in  $69\frac{6}{17}$  of the wounded. The following, extracted from his table, will show the number of wounded in the different engagements, and the relative number of cases of tetanus which occurred—

May 5th.— <i>Attacking Lines.</i>	March 10th to 16th.— <i>General Actions and Skirmishes.</i>
Wounded ..... 382	Wounded ..... 490
Tetanus ..... 1 in $63\frac{1}{2}$	Tetanus ..... 1 in $44\frac{1}{2}$
June 6th.— <i>Attacked in Lines.</i>	May 16th and 17.— <i>Assault of Irun.</i>
Wounded ..... 66	Wounded ..... 83
Tetanus ..... 1 in 22	Tetanus ..... 1
Oct. 1st.— <i>Attacked in Lines.</i>	Total Wounded ..... 689
Wounded ..... 158	Total aver. Tetanus 1 in $69\frac{6}{17}$
Tetanus ..... —	

<sup>1</sup> Dublin Hospital Reports, vol. iii.

<sup>2</sup> 1838.

Fournier-Pescay<sup>1</sup> states that it was frequently observed in Spain among the French soldiers, after long marches in the hot sun, and sleeping on the ground at night exposed to the air. After the battle of Waterloo<sup>2</sup> but few cases occurred among the wounded belonging to the artillery and engineers.

2. *Campaign of Egypt*.<sup>3</sup>—It occurred after the battles of Sedman, Pyramids and Aboukir, from exposure to the cold damp air at night. It occurred among the wounded after the combat of El A'rish, from their being placed under tents pitched on wet ground; it rained incessantly: after the revolt at Cairo, from the wounded being placed in a hospital the walls of which were washed for three months in the year by the Nile: at the taking of Jaffa, from the hospital being placed close to the sea; the weather was very wet. In the expedition into Syria<sup>4</sup> the wounded suffered from tetanus, more from the extreme variations in the temperature than from the great heat.

Dr. Dickson<sup>5</sup> observes, that at the time tetanus was so frequent among the French, the English and French wounded under his care did not suffer.

At the taking of Java in 1811,<sup>6</sup> of 150 Europeans wounded at the taking of Fort Cornelius only one was seized with tetanus, while of eight or ten wounded in a

<sup>1</sup> Dict. des Science Médicales, art. tétanos.

<sup>2</sup> Dr. O'Beirne.      <sup>3</sup> Larrey: *Memoirs de Chir. Militaire*.

<sup>4</sup> Desgenette's *Hist. Méd. de l'Armée d'Orient*, 109.

<sup>5</sup> *Medico-Chir. Trans.*, vol. vii.

<sup>6</sup> Dr. Badenach, cited by Sir G. Ballingall.



small detachment which proceeded to Macassar, two died. In the attack upon Sambas,<sup>1</sup> in the island of Borneo, a large number of tetanic cases occurred both among the Europeans and Sepoys.

In the *campaign of the Punjaub*, in 1848 and 1849,<sup>2</sup> out of 446 gunshot and 105 incised wounds, which occurred to the European troops, only two cases of tetanus occurred. No cases occurred among the Sepoys, although the number of wounded was about double.

In Burmah, no cases are returned in the army reports in 1824, 1825, and 1826. During the last war no cases seem to have occurred in the 18th and 30th regiments.<sup>3</sup>

4. *Campaigns of Austria, Russia, and Saxony.*—The wounded in the Austrian campaign of 1809, exposed to the cold, damp air of the spring nights, after having passed through strong heat during the days, were nearly all seized with tetanus. The thermometer was in the day from 19° to 23° Reau. above zero ; in the night 13·9, and 8.<sup>4</sup> A few cases occurred after the battle of Eylau ;<sup>5</sup> but few after that of Moscow, although the heat was very great. After the battle of Dresden it was very frequent ; the weather was very cold and wet.

5. *Campaign of the Crimea.*—Scribe<sup>6</sup> states that

<sup>1</sup> Mr. Schaw : cited by Sir G. Ballingall, *Military Surgery*, 5th ed.

<sup>2</sup> Dr. Renney : *Indian An. of Medical Science*, 1857.

<sup>3</sup> Drs. Taylor and Stewart, *Ibid.*

<sup>4</sup> Larrey : *Clinique Chir.*, tome i., 1829.

<sup>5</sup> *Ibid* : *Mem. de Chir. Militaire*.

<sup>6</sup> *Relat. Medico-Chir.*, *Campagne d'Orient*, 1857.

although the French had 43,000 wounded, only thirty cases of tetanus occurred.

6. *Siege of Antwerp*.<sup>1</sup>—During the siege no case occurred, but after its termination six, among the wounded troops in the citadel. They were attributed to sudden variations in the temperature.

7. In Paris, in July, 1830, of 266 wounded brought into the Hôpital du Gros-Caillon,<sup>2</sup> only one was seized with tetanus. No cases seem to have occurred among the wounded in the Hotel Dieu and other hospitals.<sup>3</sup> According to Dr. Gillespie,<sup>4</sup> tetanus was frequent in the Hôtel Dieu in the last century, for he observes that it was common after compound fractures.

*Naval Engagements*.—In the action off Guadeloupe,<sup>5</sup> in April, 1782, 810 were wounded, 266 dying immediately, or in a short time. Of the remainder, 97 were sent into the Hospital at Port Royal, of which number 21 died. Of those which remained on board the fleet, 67 died, 60 within a month. Of this number 15 died from tetanus; another died on the voyage home. Of the 21 which died in the hospital, only one sank from the disease. Some ships suffered more than others, particularly the *Bedford* and the *Barfleur*, although there was nothing remarkable in the nature or

<sup>1</sup> Hip. Larrey : Hist. Chir. du Siège d'Anvers, 1833.

<sup>2</sup> Ibid : Relat. Chir. des Evenemens de Juillet, 1830.

<sup>3</sup> Mènière : L'Hotel-Dieu, en Juillet et Aout, 1830.

<sup>4</sup> Diseases of the Squadron on the Leeward Island Station, in 1794-5-6.

<sup>5</sup> Sir Gilbert Blane : Diseases of Seamen, 1785.

the number of their wounded. The same occurred after the battle off the Chesapeake the year before. The captured French frigate, *La Topaze*, observes Dr. Dickson, "lost two of her crew from tetanus, but no cases occurred on board of our ship." Sir Gilbert Blane states that he has seen the disease prevail in some hospitals more than others; and Dr. Hennen,<sup>1</sup> "that patients under similar circumstances in every respect shall become liable to it in one hospital, or part of a town, and be free from it in another."

2. After the action off Cuddalore,<sup>2</sup> in July or August, 1783, 1800 wounded were admitted into the Madras Hospital, of this number from forty to fifty died from tetanus. The hospital was very much crowded; several of the wounded had but just arrived in India, and were suffering from scurvy. The land winds had not done blowing.

It must have been frequent at the siege of the Havannah, for Dr. Lind<sup>3</sup> observes that five out of six of those whose limbs were amputated died of it.

3. In 1780, 167 wounded were admitted into the Barbadoes Hospital;<sup>4</sup> in nineteen of the number amputation was performed, nine died mostly from tetanus; the hospital was over-crowded. Dr. McArthur,<sup>5</sup> while at the hospital for six years prior to 1809, a most active

<sup>1</sup> Military Surgery.

<sup>2</sup> Curtis' Diseases of India, 1807.

<sup>3</sup> Diseases Incidental to Europeans in Hot Climates, 1808.

<sup>4</sup> Blane.

<sup>5</sup> Cited by Dr. Dickson.



period, and although a large number of cases of gunshot wounds and amputations came under his notice, saw only two cases; and Mr. Mortimer,<sup>1</sup> from 1809 to 1812, only one case out of twenty-three amputations, and this was attributed to the filaments of the nerves being included in the ligature. Dr. McArthur observes, "that although tetanus was once very common in the West Indies, it was now scarcely seen either in the navy or in the army." This is also the opinion of Dr. Dickson, Mr. Hardy,<sup>2</sup> Mr. Shephard,<sup>3</sup> and Sir George Ballingall. Lempriere does not seem to have seen a case among the soldiers stationed at Jamaica; or Reide,<sup>4</sup> in the 29th regiment and third battalion of the 60th regiment. Rufz<sup>5</sup> does not seem to have observed it at Martinique. The Army Medical Returns however show that tetanus is more frequent in the West Indies than in any other stations in the world. The diminution of the mortality from tetanus is not confined to the West Indies. The records of the hospitals, both military and civil, in the East Indies, show that it is now rare, not only among the Europeans, but among the natives in the employ of the Company.

4. After the attack on the French lines at Ticonderoga in 1758,<sup>6</sup> the wounded were exposed the night after the action in open boats on Lake George, nine of their number were seized with tetanus. In the expedi-

<sup>1</sup> Cited by Dr. Dickson.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Diseases of the Army, 1793.

<sup>5</sup> Annales de Hygiène, tome xliv.

<sup>6</sup> Dr. Huck : Med. Obs. and Inquiries, vol. iii.



tion to New Orleans in 1815,<sup>1</sup> the wounded in the attack of the 8th of January were exposed chiefly in open boats, and on the 10th to wet, six or seven of the number were seized with tetanus.

5. It occurred after the battle off the Chesapeake in 1781.<sup>2</sup> Most of the wounded on board of the *Amazon* after the attack on Charlestown,<sup>3</sup> in the War of Independence, were seized with it on the weather becoming wet and stormy. The *Hermes*<sup>4</sup> lost three of her crew from it after the attack on Fort Mobile in September, 1814. Dr. Rowland<sup>5</sup> during his connexion with the naval hospital at Halifax saw only two cases. The Military Reports from Canada, Nova Scotia and Newfoundland show that no cases occurred among the troops from 1837 to 1847 inclusive. After the attack on Copenhagen<sup>6</sup> tetanus was as frequent as after a military engagement. No cases occurred after the bombardment of Algiers.<sup>7</sup>

*Influence of the seasons.—In the United Kingdom.*

—1. *In London.*—From the cases collected by Mr. Poland, June was the month in which the greatest number of cases occurred, February and December the smallest; for out of seventy-two cases twelve occurred in the first-named month, two in the second, and three in the last. The smallest number of cases occurred during the first three months of the year, the greatest during the second. Thus, out of the seventy-two cases, twelve

<sup>1</sup> Dr. Dickson.

<sup>2</sup> Blane.

<sup>3</sup> François, cited by Fournier-Pescay.

<sup>4</sup> Mr. Wilson, cited by Dr. Dickson.

<sup>5</sup> Dr. Dickson.

<sup>6</sup> Cited by Mr. Poland.

<sup>7</sup> Lizar's Surgery, 5th ed.

occurred during the first three months, twenty-three during the second, eighteen during the third, and nineteen during the fourth. The bills of mortality of London for eleven years show that fewer deaths take place during the first and third thirteen weeks of the year than during the second and third. Thus, of 220 deaths registered, fifty-two occurred in the first thirteen weeks, sixty-nine during the second, forty-one during the third and fifty-eight during the fourth.

2. *In Glasgow.*—From the fifty-two cases contained in Dr. Laurie's paper the first three months seems to be the period of the year that it is most liable to occur. Of the fifty-two cases, eighteen occurred during the first three months, fourteen during the second, ten during the third, and eleven during the fourth. Of twenty-two deaths registered in Glasgow during three years, five occurred during the first three months of the year, four during the second, eight during the third, and five during the fourth.

3. *In Ireland.*—From the deaths which ensued in Ireland during ten years, it appears, as will be seen from the following table, that the mortality is greatest in the town districts in the summer and winter quarters of the year ; in the rural, in the spring, summer and winter ; in the hospitals, in the summer and winter ; and in the workhouses, in the spring and winter :—

	SPRING.	SUMMER.	AUTUMN.	WINTER.
<i>Districts—</i>				
Civic .....	19	30	14	26
Rural.....	35	31	23	34
<i>Institutions—</i>				
Hospitals .....	14	20	10	20
Workhouses...	11	6	4	8
Total .....	79	87	51	88

*In India.—Bombay.*—Of 287 cases admitted into the Jamsetjee Jejeebhoy Hospital during nine years, 108 were admitted during the four coldest months of the year (December, January, February and March) ; 101 during the four hottest (April, May, June and July) ; and 78 during the four temperate (August, September, October and November). In most years the number of cases admitted (as will be seen from the following table) were more numerous in the cold months than in the hot and temperate. This was the case in 1846, 1847, 1848 and 1850 ; in two years, 1845 and 1853, they were most numerous in the hot months ; in two years, 1849 and 1851, the same numbers were admitted in both. In every year the numbers admitted in the temperate months were below those which entered in the cold months ; in two years—1849 they exceeded those admitted in the hot months by one, and in 1850 by two.

	1845	1846	1847	1848 <sup>1</sup>	1849 <sup>2</sup>	1850	1851	1852	1853	Total in each Month.
December ...	2	4	5	4	2	4	5	6	2	34
January ...	2	3	3	—	1	2	3	2	4	20
February ...	2	3	1	5	1	6	2	2	1	23
March ...	1	3	2	4	2	3	4	3	9	31
Total .....	7	13	11	13	6	15	14	13	16	108
April .....	2	2	1	4	3	4	2	—	8	26
May .....	3	2	3	4	1	2	5	6	5	31
June .....	3	3	4	—	1	2	4	4	4	25
July .....	2	2	2	—	1	1	3	3	5	19
Total .....	10	9	10	8	6	9	14	13	22	101
August ...	2	1	5	1	1	—	2	4	—	16
September ...	—	2	1	1	2	4	3	1	1	15
October ...	—	4	2	2	4	3	1	2	5	23
November ...	4	1	1	3	—	4	4	1	6	24
Total .....	6	8	9	7	7	11	10	8	12	78

During nine years 2,815 deaths were registered in Bombay; of this number 913 occurred during the cold months, 940 during the hot, and 962 in the temperate. This shows a preponderance of forty-nine in the number of deaths in the temperate over the cold months, and of twenty-two over the hot. In only one year, 1848, the deaths were more numerous in the cold months; in four, 1849, 1850, 1852 and 1853 in the hot; and in three, 1851, 1854 and 1856 in the temperate. Mr. Peet states that the mortality in the Jamsetjee Jejeebhoy Hospital was greatest in July, August and September.

<sup>1</sup> From Mr. Peet: Transactions of Medical and Physical Society, 1849-50.

<sup>2</sup> Dr. Morehead: Diseases of India, 1856.



Thus of—

47 cases admitted in the 1st 3 months of year 30 died.

52    "                "       2nd   "       "       38   "

37    "                "       3rd   "       "       30   "

59    "                "       4th   "       "       47   "

The Bombay mortality tables show that the deaths are more numerous in the second and fourth three months of the year than the first and third. Thus, of 2,815 deaths—

660 were registered during the first three months.

737       "       "       second   "

671       "       "       third   "

747       "       "       fourth   "

DEATHS REGISTERED IN BOMBAY IN EACH MONTH DURING NINE YEARS.<sup>1</sup>

	1848	1849	1850	1851	1852	1853	1854	1855	1856	Total in each Month.
December .....	22	35	37	39	29	14	32	33	14	255
January ...	34	24	31	18	21	12	20	35	17	212
February ...	27	17	25	28	32	14	18	29	13	193
March .....	29	28	45	26	35	24	27	28	13	253
4 Coldest Months.										
Total.....	112	104	138	111	117	64	97	125	57	913
April .....	18	24	52	26	36	21	20	32	20	249
May .....	24	31	44	28	22	25	25	20	16	235
June .....	25	28	50	21	34	21	23	22	14	238
July.....	27	24	37	27	21	21	20	23	18	218
4 Hottest Months.										
Total.....	94	107	183	102	123	88	88	97	68	940
August ...	17	27	30	29	24	17	23	23	25	215
September ..	16	24	27	31	28	18	40	31	25	240
October ...	17	24	35	30	24	25	38	34	20	247
November ..	27	27	34	29	31	22	32	36	20	260
4 Temper. Months.										
Total.....	77	102	126	119	111	82	133	124	90	962

<sup>1</sup> From Dr. Leith's Annual Reports of Mortality in Bombay.

*Influence of the seasons on the form of the disease.*  
—Bombay and Calcutta are, I believe, the only places which have furnished records from which deductions can be drawn as to the relative frequency of the *idiopathic* and *traumatic* forms.

*Bombay.*—Mr. Peet observes that very few cases of idiopathic tetanus entered the hospital in the monsoon months—July, August, and September; but a larger number in the ensuing three months, October, November, and December. Thus, of thirty-seven cases admitted during these two periods, seven entered in the former and thirty in the latter. Of the seven cases, one was admitted in September, two in July, and four in August. Of the thirty, eight in October, eleven in November, and eleven in December.

The returns of the mortality in Bombay, in 1853, 1854, 1855, and 1856, bear out Mr. Peet's observation. The deaths, as will be seen from the following table, were less numerous during the monsoon months (July, August, and September) than at any other period of the year, and more numerous in October, November, and December; they were not, however, much more so than in the first and second three months of the year. Thus, of forty-one deaths registered,—

12 occurred in the 1st three months of the year.

11	„	„	2nd	„	„	„
4	„	„	3rd	„	„	„
14	„	„	4th	„	„	„

The greatest number of cases of the *traumatic* form

of the disease were admitted into the hospital in April, May, and June; the excess, however, was not so striking as in the idiopathic variety in October, November, and December. The deaths, from an examination of the mortality reports, were more numerous during the first and second three months of the year, than in the third and fourth. Thus, of fifty-four deaths registered,

17 occurred during the 1st three months of the year.

16        "        "        2nd       "        "

11        "        "        3rd       "        "        "

10        "        "        4th       "        "        "

*Calcutta.*—During five years, 1847 to 1851, inclusive, fifty-six cases were admitted into the Native Hospital.<sup>1</sup> Of this number, fifty belonged to the traumatic form, and six to the idiopathic. The greatest number of cases, as will be seen from the following table, entered in the fourth three months of the year. Thus, of the fifty cases,—

10 entered in the 1st three months of the year.

7        "        "        2nd       "        "        "

13       "        "        3rd       "        "        "

20       "        "        4th       "        "        "

Of the six idiopathic cases, three entered during the 3rd three months of the year, and one during each of the other three months.

(4.) *Influence of occupation. In Europe.*—In the majority of the recorded cases the occupations of the patients is not stated. The following table, collected

<sup>1</sup> From Dr. Jackson.

from different sources shews the occupation of 136 cases :—

Labourers, day .....	27	Gardeners .....	3
„ Agricultural ...	20	Butchers .....	6
Engineers .....	12	Baker .....	1
Carpenters or Sawyers ...	10	Miners .....	3
Masons and Bricklayers...	12	Fellmonger .....	1
Soldiers (not wounded in engagements) .....	6	Undertaker .....	1
Sailors (ibid) .....	6	Gravedigger .....	1
Porters .....	6	Coach-Guard .....	1
Lightermen and Water- men .....	3	Omnibus Conductor .....	1
Coalheavers.....	3	Farmers .....	3
Cab or Waggon Drivers	2	Of no occupation.....	2
		<b>Total, 136</b>	

*India.*—Bombay—Mr. Peet states that the following were the occupation of 106 cases admitted into the hospital.

Coolies, or Labourers.....	43	Painter .....	1
Biggaries, Coolies .....	16	Oil Presser .....	1
Domestics .....	14	Butler .....	1
Buggy Drivers .....	7	Barber .....	1
Cooks .....	7	Butcher .....	1
Grooms.....	6	Engineer .....	1
Sailors .....	6	Coachman .....	1
Weavers .....	4	Jockey .....	1
Ropemakers.....	2	Waterman .....	1
Peons .....	6	Mussaul .....	1
Baker .....	1	Silk Cleaner.....	1
Shopkeepers.....	2	Humalls .....	1
Sawyer .....	1	Shoemaker .....	1
Carpenters.....	4		
Bookbinder .....	1	<b>Total, 106</b>	



*Calcutta.*—Of twelve of the fifteen cases recorded by Dr. Jackson, two were coachmen, two khidmutgars, two spinners (females), one gardener, one coolie, one dhoby, one house-bearer, one pressman, one shopkeeper.

(5.) *Influence of constitution and habits.*—Hunter considered that tetanus depended less upon irritation of the wound than on constitutional predisposition. "It arises," he observes, "from an irritable habit, which may be increased or produced by irritation." Curtis states "that several of the patients who were seized with the disease after the action off Cuddalore, had just arrived from England, and were suffering from the effects of the long voyages, and from scurvy;" and Larrey, both in Egypt and during the campaign of Austria in 1809, that the young soldiers suffered more frequently, and after very slight wounds, than the old and seasoned campaigners. In all expeditions or campaigns, whenever the men's constitutional powers have been reduced by bad food, long voyages, overwork and intemperance, exposure to wet and cold or great variations in temperature is very liable to induce the disease in the wounded.

In civil practice the disease, as Mr. Poland remarks, "is most frequently met with in the robust." In fifteen of the seventy-two cases recorded by him the constitution and diatheses were noted. In five of the number the patients were strong and robust; in four irritable and excitable; in one plethoric; in one phlegmatic; in one of quiet disposition; in one of cheerful disposition; in one strumous, and in one fair; two

others were fair, but they are included among the strong and robust.

*The condition of body* was noted in forty-six of the seventy-two cases. In eighteen of the number it was healthy; in eleven muscular and finely made; in six robust and well-developed; in three spare; in five emaciated, and in three unhealthy.

In thirty-eight of the recorded cases the patients' constitutions is noted. In twenty-four of the number it is stated to have been strong; in ten delicate, and in four plethoric. The *habits* were noted in sixteen of Mr. Poland's cases. In seven of the number they were temperate; in six intemperate; in one dissipated; in two the patients had been living low. The habits are noted in twenty-four of the recorded cases. In sixteen of the number the patients were more or less addicted to drinking, several of them received the injuries which induced the disease when intoxicated; in eight they were either temperate or total abstainers.

Mr. Peet observes that the disease was more fatal among Mussulmen than Hindoos, native Christians, or Parsees. Thus, of—

95 Hindoos admitted, 64, or 67·1 per cent., died.

54 Mussulmen „ 46, or 85·2 „

21 Christians „ 13, or 61·9 „

12 Parsees „ 5, or 41·6 „

Dr. Jackson notices the caste in fourteen of the fifteen cases which entered the native hospital at Calcutta. Six of the number were Mussulmen, six Hindoos, and two native Christians.

(6.) *Influence of cold and wet, and atmospheric changes.*—1. *On the idiopathic form.*—In Europe the most frequent excitants of the disease are sudden exposure to cold or wet when heated or convalescent from acute diseases, particularly of the lungs or organs of the abdomen: long-continued exposure to wet and cold, particularly when fatigued or exhausted, and sleeping on the damp ground, in the night air, or in out-houses.

In hot climates the same causes, but more easily, excite it. The writers on diseases of these regions contain instances where it has occurred after small-pox, dysentery, fevers, aphthæ, sore-throat, salivation for the cure of syphilis, &c. The coloured population suffer more frequently from the disease than Europeans. This does not arise from the former being more susceptible than the latter, but from being more exposed to the causes which excite it. If both races were equally exposed, the European would be more liable. In the latter part of the last century, and first few years of this, during the struggle between the French and English, tetanus was more liable to occur among the wounded Europeans than among the negroes and sepoys. Dallas observes that forty-nine out of fifty of the wounded Europeans in the West Indies died of tetanus; and Dazille, that nearly all the wounded of Mons. Dache's squadron landed died from the same disease. Girdlestone states that tetanus or spasms was the first disease that appeared among the English troops landed in Madras in 1782. More than fifty were seized with it during the first three



days, and in less than a month 1000. The causes were, sleeping on the ground, and drinking large quantities of bad arrack. Bontius observes that it was very frequent at the Dutch settlement of Batavia, and from the same causes. Although the disease is now but rarely met with among the European troops or sailors, yet in all expeditions where they are much exposed to the hot sun during the day, and the cold dews at night, or great alternations of temperature, their strength being reduced by long marches and intemperance, they will be much more liable than the coloured troops.

2. *On the traumatic form.*—The same causes which excite the *idiopathic form* exert a powerful influence in inducing the *traumatic*. A large number of the cases recorded as traumatic being in fact idiopathic; the presence of a slight abrasion, puncture, or cicatrised wound, being considered sufficient to stamp them as traumatic; the influence of cold or wet, or any other cause capable of exciting the disease being overlooked.

Sir Gilbert Blane states that at Barbadoes tetanus was most frequently observed among the wounded placed in parts of the hospital where they were exposed to currents of air. Dr. Gillespie<sup>1</sup> saw the disease excited in a sailor from this cause three days after amputation of the arm; Dazille, that in *St. Domingo* and the other French colonies it was often excited by no other cause than “from the invalids’ revelling in the fresh humid air; and Pasquier<sup>2</sup> that among the wounded in the

<sup>1</sup> Diseases of the Squadron on the Leeward Station, from 1794 to 1796.

<sup>2</sup> Thèse de Paris, 1804.



*Island of Bourbon* it was frequently excited by exposure to cold.

Dazille saw it occur in a merchant on the third day of compound fracture of the leg, on the occurrence of cold, rain, and wind ; in a female some days after the removal of a small gland in the breast, from the same cause ; in a male who had received some shots in the arm, the wounds from which were doing well, on the weather changing suddenly ; and in an officer who had been operated on for traumatic aneurism of the leg, one month after the operation, from dressing the wound early in the morning near an open window—the disease appeared the next day.

St. Bris<sup>1</sup> saw it occur at *Cap Francais* in a negress suffering from an abscess of the foot, from getting wet. Arthaud,<sup>2</sup> in a negro with two large wounds on back from being flogged, from the same cause ; in a young man who had wounded his hand with the ramrod of a pistol, from bathing in the sea, the wound had nearly healed ; and in a wounded negro, from exposure to cold and wet.

Campet<sup>3</sup> saw it occur at *Cayenne*, on the tenth day, in a negress aged eighteen, whose leg had been amputated for disease of the tibia, from being placed in a damp, draughty-room ; in a male, aged twenty-four, who had injured his cheek and arm, on the third day, from sleep-

<sup>1</sup> Dissert. et Obs. sur le Tétanos : Publiées, par le Cercle des Philadelphs, 1786.

<sup>2</sup> Ibid.

<sup>3</sup> Traité Pratique des Maladies Graves, 1803.

ing in a hammock but little raised from the ground in a hut in the woods ; in a soldier, aged thirty, with sores on the sacrum, two days after they had been scarified, from a current of air descending from a window just over his head ; in two other patients—one a soldier, the other a civilian—both suffering from punctured wounds of the foot, one from a nail, the other from a fish-bone ; a similar cause excited the disease on the ninth and tenth days—the civilian had several relapses, from exposure.

Curtis states that the wounded brought into the hospital at Madras, after the action off Cuddalore, were badly lodged, and that the land winds had not ceased : Dr. Morehead, that a considerable proportion of the cases admitted into the Jamsetjee hospital, at Bombay were attributed to sleeping on the damp ground exposed to the night air.

Dr. Clark (*Diseases of Long Voyages*) saw it occur in China, in a sailor suffering from a slight injury of the little finger, from being exposed all night in an open boat.

Dr. Anderson<sup>1</sup> saw it occur at Trinidad, in a middle-aged negro, suffering from a neglected ulcer of one of the toes, from exposure to cold and damp ; and in a negress,<sup>2</sup> who had been cupped in the temple with a blunt knife and a small calabash, from exposing herself to rainy and sultry weather.

Mr. Ellis<sup>3</sup> observed it occur in a young negress, eighteen days after running a piece of wood into her

<sup>1</sup> Edin. Medico.-Chir. Trans., 1826.

<sup>2</sup> Ibid, 1824.

<sup>3</sup> Medical Commentaries, 1794.

foot, after washing in the river all day—the wound was dry; and Mr. Bewcastle,<sup>1</sup> in a negress, aged forty, suffering from ulceration of the foot, whose hut was in bad repair, during damp, foggy weather. Dr. Murray,<sup>2</sup> at the Cape of Good Hope, in a lad aged ten, suffering from fracture of the tibia and fibula, and laceration of the skin, which subsequently sloughed, on the ninth day, either from a current of cold air, or from being disturbed by a noise in the street.

In *Egypt*, Larrey attributed the occurrence of the disease among the wounded after the different engagements, either to exposure to the damp night air, or placing them on the wet ground, or in damp wards; Desgenettes, to the great difference of temperature between the days and nights, and exposure to the cold, damp air from the sea. Mayheux<sup>3</sup> saw it occur at Cairo, in a soldier, on the ninth day, of a bullet-wound of the arm; and Carion<sup>4</sup> on the twenty-fifth, of a bullet-wound of the fleshy part of the thigh, from exposure to the damp night air on the banks of the Nile. The latter also saw it excited in four slightly wounded soldiers from the window of the ward which faced the Nile being left open. He observes, “that several similar cases occurred from the same cause.”

In *America*.—Eight of the wounded in the assault on Montmorency, on the 31st July, 1759,<sup>5</sup> placed in low cells in the hospital, which was situated in a low part, and very accessible to moisture, were seized with tetanus.

<sup>1</sup> Med. Obs. and Enq., vol. vi.

<sup>2</sup> Medical Gazette, vol. xii.

<sup>3</sup> Thèse de Paris, 1808.

<sup>4</sup> Ibid, 1809.

<sup>5</sup> Dazille.



Although the number of wounded was large, these were the first cases of tetanus observed ; nine of the wounded at the attack on Ticonderoga<sup>1</sup> were seized with the disease, from being exposed in open boats all night on Lake George ; and seven of the wounded at the attack on New Orleans,<sup>2</sup> from being exposed in open boats to the night air and to wet. The wounded on board the *Amazon*,<sup>3</sup> after the attack on Charlestown, were seized with the disease on the weather becoming wet and stormy.

In *Europe*.—It was frequent in the mountains of Bohemia and Moravia<sup>4</sup> during the Seven Years' War, from the hot days and cold nights, and in the Austrian campaign<sup>5</sup> of 1809 from a similar cause. It was very liable to occur among the wounded in Genoa<sup>6</sup> during the blockade, when the sea-breeze caused variations in the temperature of the atmosphere. A large number of the wounded after the battle of Dresden<sup>7</sup> were, from the weather changing from warm to cold and wet, seized with the disease. A sudden change in the temperature caused it to occur in six of the wounded at the siege of Antwerp,<sup>8</sup> and after the battle of Goito;<sup>9</sup> five of the wounded in the Hiedelberg Klinik<sup>10</sup> were seized with it in one night from a cold night succeeding a hot day.

<sup>1</sup> Huck.<sup>2</sup> Dickson.<sup>3</sup> François.<sup>4</sup> Schmucker : Chirurgische Wharneim, bd., ii.    <sup>5</sup> Larrey.<sup>6</sup> Desgenettes.<sup>7</sup> Larrey.<sup>8</sup> Hip : Larrey.<sup>9</sup> Beck : Die Schuss-Wunden nach auf dem Schlachtfeld wie in dem Lazerethe Wahrende den Jahren, 1848-9.<sup>10</sup> Simon : Ueber Schuss-Wunden, 1851.



Dennis,<sup>1</sup> Stutz,<sup>2</sup> Müller,<sup>3</sup> and Boyer,<sup>4</sup> have seen it excited by the wounded being left exposed all night in the open air. The last writer has recorded several instances. He also mentions a case in which it was excited in a patient suffering from a pistol-wound of the face, from walking in a damp court exposed to the cold wind. Meyheux saw it occur in three soldiers but slightly wounded, from being conveyed twelve leagues in cold weather in an open cart; and Hévin<sup>5</sup> in a soldier wounded by a bullet in the lower part of the thigh, from passing the night, which was very cold, on a high mountain: the day had been very hot.

Ambrose Paré<sup>6</sup> saw it occur in a soldier who had had his arm amputated at the elbow, for gangrene following a wound of the wrist, on the twelfth day, from being lodged in a granary exposed to all winds and badly covered. Ledeschault,<sup>7</sup> in a soldier wounded severely by a bullet in the upper part of the thigh at the battle of Baurtzen, from passing the sixth night, which was cold, in a large draughty grange; Pasquier, in a soldier who had received a bullet through the arm, from exposing the wound early in the morning of the thirteenth day before an open window for some time; Blaguière,<sup>8</sup> one month after a bullet-wound which had fractured the

<sup>1</sup> Jour. de Observat., 1763-8.

<sup>2</sup> Gazette Méd. de Salsburg, 1801.

<sup>3</sup> Dissert de Strasbourg, 1802.

<sup>4</sup> Malad. Chirurgicales.

<sup>5</sup> Thèse de Paris, 1813.

<sup>6</sup> Œuvres Complet, par J. F. Malgaigen, tome ii., 233.

<sup>7</sup> Thèse de Paris, 1815.

<sup>8</sup> Ibid. 1815.

bones of the forearm, from being sent to another hospital, the weather being cold and wet : the wound had nearly cicatrized ; Antheaume,<sup>1</sup> in an officer, on the twenty-ninth day after the operation for strangulated hernia, from sleeping opposite an open window : the wound had healed.

“The disease,” observes Dupuytren,<sup>2</sup> “is most frequently met with in the civil hospitals and in private practice, from a current of air being directed on the beds of the wounded.” It was particularly from this circumstance that he had observed it. He considered that it was most liable to occur during the prevalence of the north wind. Larrey<sup>3</sup> observes that the wounded soldiers were most susceptible to the disease during north-west winds, from the humidity which accompanied them ; and Mr. Poland, that the greatest number of cases occurred among the patients admitted into Guy’s Hospital during the existence of westerly winds. He observes, that “there is a greater prevalence of these winds in this country.”

From the following table of forty-two cases, the influence of cold, wet, and exposure to the air, will be seen.

In some cases the disease was excited immediately after the receipt of the injury, either by cold, cold and wet, or sleeping in the open air at night ; in others, although some constitutional disturbance followed imme-

<sup>1</sup> Thèse de Paris, 1811.

<sup>2</sup> *Traité des Blessures*, 1834, tome i.

<sup>3</sup> *Clinique Chirurgicale*, tome i.

diately, or soon after the exposure, the disease was not developed for two, three, four, five, or even seven or eight days ; in one case the patient was exposed to wet the day after the receipt of the wound, the disease appearing the next day ; in several cases the wounds were cicatrizing or nearly healed ; in one case the wound had been healed a week, in another the same, but the skin was very sensitive.

In the cases in which the disease was excited by exposure to a current of cold air, it appeared from the fifth to the twenty-fifth day ; in two cases—one abscess of the finger, the other scrofulous sores on legs—the patients were heated at the time ; in a third, the patient had crushed his finger ; in a fourth, a wound on the arm from the bite of a horse ; in a fifth and sixth, the hands had been severely injured by bursting of guns ; in a seventh, the breast had been amputated ; in an eighth, the thigh ; in a ninth, both legs had been fractured, one had been amputated, and from the other pieces of bone removed ; in a tenth, both bones of leg had been fractured.

Sex and Age.	Part of body Wounded and nature of Wound.	Causes.	Period of occurrence of Tetanus.
1. M 50	1. <i>Of Head and Face.</i> Wounds of head and arm, from piece of rock, nearly healed.	Exposure to cold <sup>1</sup>	9th day of wound
2. 53	Lacerated wound of bridge of nose	Got wet through several times <sup>2</sup>	

<sup>1</sup> Schmidt's Jahrbücher, 1835.

<sup>2</sup> Mr. Poland, case 69.

Sex and Age.	Part of body Wounded and nature of Wound.	Causes.	Period of occurrence of Tetanus.
3. 22	Lacerated skin of nose from a blow; two months before had injured arm with drill; the wound healed	Lay the same night in the open air exposed to wet <sup>1</sup>	9th day of injury of nose
4. 30	Lacerated wound of cheek and compound fracture of malar bone from kick of a horse	Lay in a hay-loft all night <sup>2</sup>	5th day of wound
2. <i>Of Trunk.</i>			
5. F 26	After removal of tumour from back	Exposure to cold <sup>3</sup>	3rd day of operation
6. F —	After removal of breast	Exposure to draught from window on 13th day <sup>4</sup>	13th day of operation
7. M 47	Ulcerated tumour of skin	Exposure to cold <sup>5</sup>	
8. 33	Old scrofulous sore over sternum; strained back in carrying sack of coals	After strain got wet and sat by large fire for two hours <sup>6</sup>	The day after getting wet; neck stiff; again got wet; tetanus five days after the strain
3. <i>Of Scrotum.</i>			
9. 19	Lacerated scrotum from a fall	Exposure to cold <sup>7</sup>	8th day
10. M 48	After operation for Sarcocoele	Ditto <sup>8</sup>	
11. M —	Ditto	Ditto <sup>9</sup>	
12. M —	Ditto, 22nd day; wound healed, save where ligature had been applied	Ditto <sup>10</sup>	22nd day of operation

<sup>1</sup> Dr. Banks : Dublin Medical Journal, 1852.<sup>2</sup> Mr. Poland, case 17.      <sup>3</sup> Schmidt's Jahrbücher, 1835.<sup>4</sup> Schmucker.      <sup>5</sup> Lobstein : De Nervi Sympath Humani.<sup>6</sup> Mr. Poland, case 40.<sup>7</sup> Gehrich, cited by Friederich : Dissert. de Tetano, Berlin, 1837.<sup>8</sup> Dennis.<sup>9</sup> Sabatier.<sup>10</sup> Boyer.



Sex and Age.	Part of body Wounded and Nature of Wound.	Causes.	Period of occurrence of Tetanus.
	<i>4. Of Arms &amp; Hands.</i>		
13. 30	Wound of arm from scythe when drunk	Lay all night in the open air <sup>1</sup>	24 hours
14. 18 to 20	Skin and muscles of arm crushed by bite of a horse; the parts sloughed away	Twenty - fourth night exposed to draught from window <sup>2</sup>	25th day of injury
15. 50	Incised wound of third finger of left hand	A few days after exposed to wet and fatigue for three successive days <sup>3</sup>	Some days after exposure to wet
16. M —	Slight wound of fingers; wound nearly healed	Exposed to night air on deck for a few minutes while obtaining a draught of water <sup>4</sup>	
17. 30	Amputated fingers; wound nearly healed	From exposure <sup>5</sup>	
18. 15	Wound of top of finger; healed one week	Exposure to cold and wet <sup>6</sup>	
19. 18	Slight puncture of finger	Wet the day before <sup>7</sup>	2nd day of wound
20. 28	Cut off finger with chopper	Plunged arm into cold water <sup>8</sup>	
21. 24	Crushed ring finger	Finger amputated; inflammation followed; sixth day exposed to cold <sup>9</sup>	9th day of operation

<sup>1</sup> Myself.<sup>2</sup> Antheaume.<sup>3</sup> Dr. Cavallini: Medical and Physical Journal, vol. xliii.<sup>4</sup> Mr. Howship: Ibid, vol. xxi.<sup>5</sup> Dr. McArthur: Medico-Chir. Trans., vol. ii.<sup>6</sup> Dr. Bright; Reports, case 275.<sup>7</sup> Mr. Poland, case 31.<sup>8</sup> Fournier-Pescay.<sup>9</sup> Mr. Poland, case 48.

Sex and Age.	Part of body Wounded and Nature of Wound.	Causes.	Period of occurrence of Tetanus.
22. 28	Crushed top of finger	One month afterwards from exposure to frost it became painful <sup>1</sup>	4th day after exposure.
23. 19	Severely lacerated hand from explosion of powder horn; wound healed, but skin very sensitive	Exposed to intense cold on hills at night for several hours; became very painful <sup>2</sup>	2nd day after exposure
24. M 40	Punctured thumb with clean nail	Twenty-six days after exposed to cold for two nights <sup>3</sup>	4 days after exposure
25. M 29	Punctured middle finger with nail	Exposure to cold <sup>4</sup>	10th day of puncture.
26. F 19	Splinter of wood into middle phalanx of one of the fingers abscess, discharging	When warm exposed to draught from window <sup>5</sup>	26th day of wound
27. M 12	Part of hand blown away by bursting of gun; wound doing well	Night of twenty-fifth day exposed to draught from window <sup>6</sup>	
28. M —	Hands wounded and bones fractured by bursting of gun; next day much hæmorrhage, wound doing well	Exposed to draught <sup>7</sup>	
29. M —	5. <i>Of Legs and Feet.</i> After removal of atheromatous tumour from thigh	From changing bed-clothes <sup>8</sup>	

<sup>1</sup> Dr. Willmot: Dublin Med. Journal, 1848.<sup>2</sup> Myself.<sup>3</sup> Mr. Poland, case 12.<sup>4</sup> Dr. Baumbach, cited by Friederich.<sup>5</sup> Funk: Ruckenmark's Entzündung, 1825.<sup>6</sup> Antheaume.<sup>7</sup> Dombey: Thèse de Paris, 1809. A male, aged thirty, crushed one of his fingers; from exposure to current of air, tetanus next day.  
<sup>8</sup> Bullenot: Thèse de Paris, 1818.<sup>9</sup> Wendt: Heidelberg Klinik, 1827.

Sex and Age.	Part of body Wounded and Nature of Wound.	Causes.	Period of occurrence of Tetanus.
30. 22	After amputation of leg above knee for disease of knee; nine years before amputation below knee for disease of ankle	Exposure to current of cold air <sup>1</sup>	11th day of operation.
31. 36	Legs crushed by wheels of vehicle—one amputated, from the other splinters removed	Exposed to draught from window while asleep on fifth day <sup>2</sup>	In two hours awoke with Tetanic symptoms
32. —	Slight excoriation	Walking in the cold in the convalescent court <sup>3</sup>	
33. 28	Old sore on skin from cutting it with spade	Exposure to wet <sup>4</sup>	The day after exposure
34. 40	Scrofulous sores on legs	Exposure to a current of cold air when heated <sup>5</sup>	Soon after exposure
35. 13	Punctured leg with prong of pitchfork, four inches above ankle	Three days after exposed to wet <sup>6</sup>	Six days after exposure
36. 13	Wounded toes	Exposure to cold <sup>7</sup>	2nd day of wound
37. 13	Punctured toe while bathing	Bathed several times subsequently <sup>8</sup>	3rd day of wound
38. 24	Punctured foot with rusty nail	Four days after bathed while heated <sup>9</sup>	Day after bathing
39. 15	Punctured foot with nail	Kept watch the same night; weather cold <sup>10</sup>	In morning Tetanus

<sup>1</sup> Mr. Poland, case 72. Male, aged 24, (case 13,) compound fracture of both bones of leg; twenty-fifth day of admission exposed to draught, two days after tetanus.

<sup>2</sup> Antheaume.

<sup>3</sup> Janson: Clinique de l'Hôtel Dieu de Lyons.

<sup>4</sup> Mr. Solly: Medical Gazette, vol. xxxiv.

<sup>5</sup> Mr. Poland, case 29.

<sup>6</sup> Dr. Cross: London Medical and Physical Journal, vol. xxxvii.

<sup>7</sup> Dr. Baumbach.

<sup>8</sup> Mr. Poland, case 27.

<sup>9</sup> Ibid, case 8.

<sup>10</sup> Dr. Murray: Medical Gazette, vol. xi.

Sex and Age.	Part of body Wounded and Nature of Wound.	Causes.	Period of occurrence of Tetanus.
40. 19	Laceration of integuments and fracture of bones of foot	Exposure to cold <sup>1</sup>	7th day of injury
41. 14	Abscess of foot from wound with iron spike ; discharging	Exposure to wet <sup>2</sup>	Four days after exposure
42. 37	Abscess of foot from wound with nail ; discharging	Exposure to frost and snow <sup>3</sup>	

Antheaume saw it occur on the thirty-second day after the operation for stone, in a male aged twenty-one, from exposure to the night air while suffering from diarrhoea, brought on by over-eating ; the wound in the bladder had healed.

From *fatigue and over-exertion*.—Among soldiers severe exertion after slight wounds sometimes induces the disease, particularly in hot weather.

Mr. Maxwell<sup>4</sup> saw it occur in a male aged twenty, who had run a splinter of wood into his thumb, from a long journey on the eighth day ; the disease appeared on the following day. Mr. Mumfold<sup>5</sup> in a male aged fifteen, on the eighteenth day of amputation of the thumb, from walking eighteen miles. Mr. Liston<sup>6</sup> in a male aged fourteen, who had lacerated his hand with a spike,

<sup>1</sup> Wendemeyer, cited by Friederich.

<sup>2</sup> Medical Gazette, vol. ii.

<sup>3</sup> Mr. Samuel Cooper, *Ibid.*, vol. xxvii.

<sup>4</sup> On Tetanus and Yaws.

<sup>5</sup> Edin. Medical and Surgical Journal, vol. xxiv.

<sup>6</sup> Edin. Medical and Surgical Journal, vol. xxi.



from over-heating himself by running after a carriage ; and Dazille, in a student aged twenty-one and a half, on the tenth day, of a slight wound, from playing at tennis, by which he was much fatigued and heated.

(7.) *Influence of mental emotions.*—Trismus and tetanus have been observed to occur in females and delicate males from terror. In the former there has generally existed a tendency to hysteria. It has generally yielded readily to anti-spasmodics. When it has occurred in males it has seldom been of long duration. I am not aware that it has ever proved fatal.

Fear, mental anxiety, fits of passion, and noises have been known to excite the disease after wounds and operations, and cause it to reappear when the patients have been convalescent. A dread of the disease and sympathy sometimes causes it to occur.

Leclerc<sup>1</sup> and Dr. Hennen have seen it excited by fear, and Dupuytren<sup>2</sup> by the threats of a creditor. In a case recorded in the *Gazette Médicale de Salsburg* for 1800,<sup>3</sup> the dread of a slight operation caused the disease to return.

Willan<sup>4</sup> saw it excited by grief ; it occurred from this cause in a patient in the Hôtel-Dieu.<sup>5</sup> A relapse ensued in a soldier<sup>6</sup> who was convalescent from it, from his money being stolen.

<sup>1</sup> Cited by Briott.

<sup>2</sup> *Traité des Blessures.*

<sup>3</sup> Cited by Müller.

<sup>4</sup> Cited by Rush : *Med. Obs. and Inquiries.*

<sup>5</sup> Thomassin : *Thèse de Paris*, 1835.

<sup>6</sup> Canin, cited by Briott.

Wepfer<sup>1</sup> saw it occur in a boy seven days after the operation for hernia, from a fit of passion—death ensued on the tenth day; and Mr. Key<sup>2</sup> a relapse in a gentleman who had just recovered, from the same cause; death ensued.

Dupuytren states that he has several times seen wounded patients seized with the disease from firing guns and cannon, particularly the latter, near the hospital. In a case in the Salsburg Hospital, firing a gun under the window caused the disease to return.

(8.) *Influence of parts wounded, nature of the wounds, and period of the occurrence of the disease.*—

*In naval and military practice.* 1. *In hot climates.*

—Sir Gilbert Blane observes that “several surgeons attributed its frequency to taking up the vessels with the needle, and that when the tenaculum was used it seldom occurred.” It was very common during the last century after amputations. Of nineteen amputations performed in the Barbadoes Hospital in 1780, nine died, “mostly from this disease.” At the siege of the Havannah, Lind states that five out of six of the amputated cases were seized with it. Dazille considered “that dressing the wounds with irritating applications excited the disease.”

The circumstances which favour the development of the disease are,—1st, The health being undermined by long voyages in overcrowded ships, intemperance, fatigue, and exposure; 2nd, Exposure of the wounded immediately after the receipt of the wounds, or at any

<sup>1</sup> Cited by Lieutaud, Hist. Anat. Méd. Sistens.

<sup>2</sup> Travers on Constit. Irritation.

period until the health is fully restored, to cold, wet, or currents of cold air ; 3rd, Conveying the wounded long distances on the backs of animals, or in inconvenient vehicles, particularly in cases of compound fractures or wounds containing splinters of wood or bone, bullets, pieces of shell, or any other substances capable of exciting irritation ; 4th, The loss of much blood, or being obliged to walk a long distance before surgical assistance can be obtained ; 5th, Irritating the parts by attempting to find bleeding vessels in an inflamed and infiltrated wound ; 6th, Including a nerve or a larger portion of muscle in the ligature ; 7th, Delaying amputation in cases in which the bone is much shattered, the soft parts extensively lacerated, crushed, or carried away, until after-inflammation or gangrene appears.

2. *In Europe*.—The same causes excite the disease as in hot climates. The tendency seems to be, however, stronger in the latter than in the former. In both it may occur in a few hours after the receipt of the wounds, and is generally excited by exposure to cold or irritation of the wound, or as late as the twenty-eighth day ; in these cases it is generally excited by exposure to cold or wet.

In *flesh-wounds*, whether of the head, face, arm, thigh, or leg, the disease in hot climates seems to be most liable to occur from the fourth to the eleventh day. Of nine cases in which the period is named it ensued in eight of the number. In *Europe* the period of the greatest liability seems to be from the ninth to the twenty-first day ; thus, out of twenty-one cases, in which the period when the disease occurred is noted—

in five it ensued from the ninth to the twelfth day inclusive ; in six from the thirteenth to the sixteenth inclusive ; in four from the seventeenth to the twenty-first inclusive ; in the six remaining cases, in two it occurred within twelve hours ; in the other three on the twenty-third, twenty-sixth, and twenty-eighth days.

In wounds of the *bones, joints* (elbow or knee), *feet and toes, hands and fingers*.—The cases which occurred in *hot climates* furnish no evidence as to the period when the disease is most liable to occur.

In *Europe* the liability is most marked from the fourth to the seventeenth day. Thus, of thirty-three cases, in three it occurred within twenty-four hours ; in six from the fourth to the seventh day inclusive ; in nine from the eighth to the tenth inclusive ; in six from the eleventh to the thirteenth inclusive ; in seven from the fourteenth to the sixteenth inclusive ; in the two remaining cases on the eighteenth and twenty-eighth day.



TABLE SHOWING THE PARTS OF THE BODY WOUNDED, AND NATURE OF THE WOUNDS, IN 174 CASES OCCURRING IN NAVAL AND MILITARY PRACTICE IN EUROPE, WITH THE PERIOD OF THE OCCURRENCE OF THE DISEASE IN 71; AND OF 67 OCCURRING IN NAVAL AND MILITARY PRACTICE IN HOT CLIMATES, WITH THE PERIOD OF THE OCCURRENCE OF THE DISEASE IN 21.

Parts wounded and nature of wound.	No. of Cases.	EUROPE. <sup>1</sup> Period of occurrence.	No. of Cases.	HOT CLIMATES. <sup>2</sup> Period of occurrence.
1. Scalp wounded (lacerated)	2	14th and 21st day		
2. Face wounded (lacerated)	2	One on 10th day	2	5th and 10th day
3. Face burnt	1	Third day		
4. Arm wounded by bullet, splinter of wood or shell	18	In twelve periods named, 12th day, 13th, 13th, (14th bone splintered) 14th, (18th hand also wounded, 18th foot also wounded) 20th, 23rd, & 26th	12	In six periods named, 2 on 7th day, 2 on 8th, 9th, and 10th
5. Elbow wounded by bullet, splinter of wood or shell	6	In four periods named, 5th day, 7th, 8th, and 12th	3	Two on 9th day, and 3 on 22nd
6. Arm shattered or carried away by cannon ball—amputation; this generally secondary	20a	In eight periods named, 8th day, 9th, 10th, 11th, 14th, 15th, 16th, and 17th. <i>a</i> In three cases the amputation was performed on the field	9	Period named, in 2 14th and 22nd day
7. Arm fractured, flesh bruised or lacerated, and bone sometimes comminuted	8	In five periods named, 9th day, 10th, 14th, 14th, and 28th		
8. Radius and ulnar fractured, flesh bruised, or lacerated, and bones comminuted	3	In one on 16th day		

<sup>1</sup> Collected from the different works and theses on Naval and Military Surgery, English, French, German, and Italian Journals; Naval and Military Reports, and Hospital Records.

<sup>2</sup> Collected from Naval and Military Works; Works on Diseases of Hot Climates; Reports, and English and French Journals.

Parts wounded and nature of wound.	No. of Cases.	EUROPE. Period of occurrence.	No. of Cases.	HOT CLIMATES. Period of occurrence.
9. Hand shattered by musket or cannon ball, amputation secondary	4	In one period named, 4th day, the wound slight and cicatrizing	8	
10. Fingers crushed or lacerated	7	In two periods named, one on 14th day, the other on 15th	4	In two periods named, 15th day and one month
11. Finger, sabre wound	1	5th day. Some time before angle of jaw fractured by bullet, since on change of temperature its muscles liable to spasms	...	
12. Finger or fingers amputated	1	The wounds cicatrizing	3	In one on 12th day
13. Scapula fractured or splintered by bullet or piece of shell	3		...	
14. Wound of vertebræ	4	In one the splinters of bone irritated the nerves	...	
15. Thigh wounded by bullet, splinter of wood or shell	22a	In seven periods named; in two within 12 hours, 5th day, 11th, 13th, 14th, and 28th. a In two cases bone splintered	4	In one on 26th day
16. Thigh fractured, flesh lacerated or contused	5	In one case it occurred soon after the accident	2	
17. Knee wound by bullet or piece of shell	11	In three periods named, 10 hours, 12 days, 14	...	
Knee wound by sabre	1	28th day	...	
18. Thigh, amputation of, for wound of knee, or from leg being carried away by cannon-ball	8b	In two periods named, 8th day, 9th. b In two cases the amputation was immediate	6	

Parts wounded and nature of wound.	No. of Cases.	EUROPE. Period of occurrence.	No. of Cases.	HOT CLIMATES. Period of occurrence.
19. Leg wound of bullet, or lacerated	2	One on 9th, the other on 12th day		
20. Leg burnt	2	One on 10th, the other on 11th day		
21. Fractured both bones, flesh contused, or lacerated, or bones splintered	14	In seven periods named, one day splinter of bone in muscle, 4th, 6th, 9th, 10th, 12th, and 14th		
22. Amputation of, for crushed ankle or foot, or severe laceration, &c., amputation secondary	17	In seven periods named, 2nd day, 7th, 7th, 8th, 9th, for severe burn, 10th and 28th day	7	In one on 24th day
Amputation for sloughing ulcer of foot	4		1	On 14th day
23. Foot crushed or bones fractured	10d	In five periods named, 5th day, 9th, 10th, 11th, and 18th. (d) In two wounds recently healed	6	In three periods named, 10th and 28th day
24. Toes injured	4	In three periods named, 9th day, 10th, and 13th	...	

*In Civil Practice.* — The circumstances which favour the development of the disease, both in hot and temperate climates, are—1st, Exposure to cold, or wet, sleeping on the ground, exposure to night air or to currents of cold air; the last is very apt to excite the disease when it impinges on a large wound. In a case of tetanus observed by Campet, the spasms of the extremity, which were intermitting when the wound was covered, became, on exposure to a current of air from a

window, constant ; but, on covering it they resumed their former character. 2ndly, Extensive lacerated or contused wounds of the muscles or skin ; severe contusions, followed by extensive sloughing ; punctures of the hands and fingers, or feet and toes, or of the nerves. 3rdly, Fractures : in simple, if one of the extremities of the bone penetrates the muscles, irritating either it or a nerve, or when the muscle and other parts are much contused ; in comminuted and compound ; the disease is very apt to occur after these, whether of the arm, forearm, hand, or fingers, or the thigh, leg, feet, or toes ; from the contusion or laceration of the soft parts, or from pieces of bone irritating the muscles or nerves.

1. *In lacerated flesh wounds*, whether of the head, face, or extremities, the disease seems most liable to occur : in *hot climates*, from the 5th to the 12th day ; in *Europe* from the 4th to the 13th. Thus of 43 cases which occurred to persons in hot climates, nearly all were either negroes or natives. In 14, it occurred from the 4th to the 6th day, inclusive ; in 16, from the 7th to the 9th, inclusive ; in 5, from the 10th to the 12th, inclusive ; in 4, from the 13th to the 15th, inclusive ; in 3, from the 16th to the 18th ; in the remaining case the disease set in soon after the receipt of the wound.

Of 66 cases which occurred to persons in *Europe* : in 1 it set in within 24 hours ; in 3, on the 2nd day ; in 2, on the 3rd ; in 11, from the 4th to the 6th day, inclusive ; in 14, from the 7th to the 9th, inclusive ; in 16, from the 10th to the 12th, inclusive ; in 5, from the 13th to the 15th, inclusive ; in 2, on the 16th ; in



1, on the 17th; in 2, on the 19th; in 1, on the 21st; in 1 on the 22nd; in 1, on the 25th; and in 2, on the 28th.

2. *In compound fractures of the bones, or simple fracture with contusion or laceration.* In *hot climates*, the period when the disease is most liable to occur, is from the 4th to the 10th day; in *Europe*, from the 5th or 6th to the 15th. Thus of 21 cases which occurred in *hot climates*, in 6 it occurred from the 4th to the 6th day, inclusive; in 8, from the 7th to the 9th, inclusive; in 4, from the 10th to the 12th, inclusive; in 2, from the 13th to the 15th, inclusive; and in 1, on the 18th. Of 45 cases which occurred in *Europe*, in 2 it occurred within 24 hours; in 1, on the 2nd day; in 1, on the 3rd; in 9, from the 4th to the 6th day, inclusive; in 11, from the 7th to the 9th, inclusive; in 6, from the 10th to the 12th, inclusive; in 7, from the 13th to the 15th, inclusive; in 2, from the 16th to the 18th, inclusive; in 1 on the 19th; 1, on the 21st; 1, on the 24th; 1, on the 25th; and 1 on the 28th. In 1 the fracture had healed.

3. *In punctured wounds of the hands and fingers, or feet and toes.*—In *Hot Climates*, the period of greatest liability is from the 3rd to the 10th day, inclusive; in *Europe*, from the 4th to the 11th. Of 29 cases which occurred (in 21 the feet or toes were punctured) in *hot climates*: in 9, the disease occurred from the 4th to the 6th day, inclusive; in 12, from the 7th to the 9th, inclusive; in 4, from the 10th to the 12th, inclusive; in 3, from the 13th to the 15th, inclusive; and in 1 on the 17th day.

Of 33 cases which occurred in *Europe* (in 20 the feet or toes were punctured), in 2, it occurred in a short time ; in 1, in 24 hours ; in 3, from the 4th to the 6th day, inclusive ; in 5, from the 7th to the 9th, inclusive ; in 7, from the 10th to the 12th, inclusive ; in 3, from the 13th to the 15th, inclusive ; in 4, from the 16th to the 18th, inclusive ; in 2, on the 21st ; 1, on the 28th ; and 1 on the 30th. In 4 other cases the wounds had healed.

4. *Feet and toes, or hands and fingers, lacerated or crushed.*—In *hot climates* the disease seems to be most liable to occur from the 4th to the 9th day ; in *Europe*, from the 4th to the 13th.

Of 31 cases (in 16 the feet and toes were the parts wounded) which occurred in hot climates : in 9 it set in from the 4th to the 6th day, inclusive ; in 11, from the 7th to the 9th, inclusive ; in 5, from the 10th to the 12th, inclusive ; in 2, from the 13th to the 15th, inclusive ; and in 2, on the 18th ; in another, the wound had nearly healed.

Of 46 cases which occurred in *Europe* (in 20 the feet or toes were the parts wounded) : in 2, the disease set in on the 2nd day ; in 9, from the 4th to the 6th day inclusive ; in 11, from the 7th to the 9th, inclusive ; in 13, from the 10th to the 12th, inclusive ; in 5, from the 13th to the 15th, inclusive ; in 1, on the 16th ; in 1, on the 21st ; in 1, on the 26th ; and in 1, on the 28th. In 2 cases the wounds had healed.

TABLE SHOWING THE PARTS OF THE BODY WOUNDED AND NATURE OF THE WOUNDS IN 375 CASES OCCURRING IN EUROPEAN CIVIL PRACTICE, AND THE PERIOD OF THE OCCURRENCE OF THE DISEASE IN 239 ; AND OF 267 OCCURRING IN CIVIL PRACTICE IN HOT CLIMATES, WITH THE PERIOD OF THE OCCURRENCE OF THE DISEASE IN 142

Parts wounded.	No. of Cases.	EUROPE. <sup>1</sup> Period of occurrence.	No. of Cases.	HOT CLIMATES. <sup>2</sup> Period of occurrence.
1. Wound of scalp (lacerated)	15	In 13, period named : 1 within 24 hours ; 2 on 3rd day—in 1, extremity of 2 fingers torn off 11 days before ; 4 on 4th day, 6th, 7th, 10th, 3 weeks, 4 weeks. 1 healed 10 days	21	In 14, period named : 4th day ; 6 on 5th and 6th ; 2 on 7th, 8th, 10th, 12th, 15th, and 16th
2. Blow on head.....	5	In 2, period named : 1 on 2nd day—chest also injured ; 1 on 4th—1 month before had cut finger, but wound cicatrized		
3. Ear pierced ; 1 with red hot iron	...	In 1st week of life—"Hufeland"	2	One to cure hydrocele, the other swelled testicle
4. Face, lacerated or wounded by falls, kicks, or splinters of wood	14	In 10, period named : 24 hours, 2nd day, 2 on 5th day, 6th, 7th, 2 on 8th, 2 on 9th, 12th, 16th, and 19th	6	Period named in 4 : in 1 soon, 2nd day, 5th, and 7th
Face, blows on (no wound)	2			
Face, burnt.....	2	One on 9th day, the other when nearly well		

<sup>1</sup> Formed from the cases in Dr. Lawrie's and Mr. Poland's Paper, and the cases recorded in works and theses on tetanus and surgery—Hospital Records, and the English and Continental Journals.

<sup>2</sup> Formed from the cases in Mr. Peet's Paper, Dr. Leith's Reports, Diseases of Hot Climates, Diseases of the French and English Colonies, Hospital and Dispensary Reports of the East Indies, and the English and Colonial medical Journals.

Parts wounded.	No. of Cases.	EUROPE. Period of occurrence.	No. of Cases.	HOT CLIMATES. Period of occurrence.
Face, fracture of bones of, or those of nose	4	In 1 on 5th day, 8th. and 12th—face also lacerated		
Face, disease of bones of	1			
Face, ulcerated .....	2			
Face, sting of bee ...	1			
5. Eye, wound of ...	3	In 2, period named : 1 on 6th, the other on 7th day		
„ extirpation of	1			
6. Tongue, wounds of		“Rush”		
7. Teeth, irritation of		“Hufeland” .....	...	“Jackson”
Teeth, cutting 2nd set	1			
Teeth, extracting	4	In 2, period named : 1 day and 2 days		
Teeth, transplanted or dislocated	2	In 1, nerve wounded		
7. Throat, fish-bone in	...		3	One on 13th day
8. Neck, wound of ...	1		1	
Neck, blow on .....	2	One on 2nd day		
Neck, „ vertebræ of	1	Third day		
Neck, ulcer of large from abscess	1			
Neck, scrofulous ulcer of	...		1	
Neck, caustic to .....	1	Sixth day		
Neck, seton in .....	1		8	From 6th to 9th day
9. Back, flagellation of			1	By fall of cask ; 5th dorsal vertebra crushed ; paralysis, 5th day sloughing, 9th, tetanus
Back, vertebræ of crushed				
Back, by fall, skin over lumbar vertebræ contused	1	Twelve hours	1	
Back, blows or falls on (loins)	3		1	
Back „ (side)	1			
Back, strain of .....	2	One on 5th day, ulcer on sternum—wet on day of strain and next day		
Falls on sacrum .....	7	In a few hours—in 6 hours trismus, and tetanus on 4th day.		
Bed sores .....	...		2	



Parts wounded.	No. of Cases.	EUROPE. Period of occurrence.	No. of Cases.	HOT CLIMATES. Period of occurrence.
Back, Bed sores scari- fying of .....	...	.....	1	Two days
Back, ulcers on .....	2	.....	5	Sixth day, 7th, 9th, 10th, and 12th
10. Body, burn .....	1	Seventeenth day		
11. Abdomen, contu- sion of .....	1			
Iliac artery, liga- ture of .....	1			
Ulcer in groin.....	1	From bubo .....	2	In 1 from bubo
12. Breast, amputa- tion of .....	6	One on 5th, 1 on 13th, and 1 on 15th day	3	
Breast, seton in .....	1		1	
13. Hernia, while re- turning gut after operation .....	...	.....	1	
Hernia, after opera- tion for .....	7	In 2, period named : 7th day and 12th. In 3, wound healed	1	Wound nearly healed
Hernia suddenly in- creasing in size while carrying a heavy burden .....	...	.....	1	
14. Penis, sting of in- sect on .....	...	.....	1	
Penis, sloughing of, from constriction ,, amputation of .....	1		1	Eighteenth day
Circumcision .....	2	"Ackermann" One on 8th day		
15. Scrotum, lacera- tion of .....	2	One on 5th day		
Hydrocele, operation for .....	1			
,, injecting .....	2	Twenty-second day, wound nearly healed		
Sarcocoele, operation for .....	4	Tenth and 17th day ; in another the liga- ture had fallen off		
Castration .....	1	Tenth day		
16. Perinaeum, lacera- tion of .....	1	Wound healed		
Stone, after operation for .....	1			
Pubic ligament pierced by splinter of bone .....	1			

Parts wounded.	No. of Cases.	EUROPE. Period of occurrence.	No. of Cases.	HOT CLIMATES. Period of occurrence.
17. Rectum, fistula of	1	Fifty-second day— joints also swollen		
Rectum, tumour, ligature of	1	Seventh day		
Piles, ligature of.....	1	Sixth day		
18. Thigh, wounds of generally lacerated	9	Eighth day, 9th, 10th, 11th, 12th, 13th, 14th, 15th, and 23th—punctured wound healed	4	
Thigh, operation for aneurism	2	In 1, wound sloughing	1	Wound healing
Thigh, caustic to ...	...	.....	1	Eighth day
Thigh, tumour of, removal	1			
Thigh, tumour of, issue in, by a piece of wood	...	.....	1	
Thigh, burn .....		In 4, period named: 7th day, both and trunk; 10th, both and legs; 10th, with side and leg; 14th, with thighs and legs	1	Thirteenth day
19. Thigh, fracture, simple	2	Soon: in 1 from bone penetrating rectus muscle; in the other from bone penetrating muscles on fore part of thigh	2	
Thigh, fracture, compound, or with laceration or contusion	4	Fourth day, 6th, 8th, and 11th	8	Period named in 5: 5th day, 7th, 9th, 12th, and 15th
Thigh, fracture of, and leg, with lacerated wound of leg	1	Eleventh day		
Thigh, amputation of	3	In 2, for disease of knee; 2 on 11th day, and 1 on 13th	2	In 1 for disease of tibia, on 10th day
20. Knee injured, or skin lacerated	7	In 1, on 5th day, 1 on 10th, 1 on 23th, and 1 on 42nd	1	Fifteenth day
Knee, skin roasted...	1	Ninth day		
Knee, ulcer and fistula of	1			
Knee, bursa inflamed and opened	1	Sixteenth day		
Knee, attempts to straighten contracted	6			

Parts wounded.	No. of Cases.	EUROPE. Period of occurrence.	No. of Cases.	HOT CLIMATES. Period of occurrence.
21. Leg, wounds of, lacerated	6	One on 2nd day, 8th, 10th, 19th, and 22nd	24	Period named in 19 : 3 on 6th day, 3 on 7th, 4 on 8th, 2 on 9th, 3 on 10th, 13th, and 14th, and 2 on 16. 1 nearly healed
Leg, incised.....	1	Seventh day—the pressure to stop the hemorrhage had caused gangrene	2	
Leg, fracture .....	3	One soon, 14th day, and 17th		
Leg, fracture, compound	7	Thirteenth day, 14th, 19th, 21st, 24th, and 25th. 1 healed	2	One on 9th day
Leg, fracture of tibia and tarsus	1	Thirteenth day—laceration of tendon of extensor muscle		
Leg, fracture, walking too soon on	2	"Rush"		
Leg, nerves, injury of	2			
Leg, amputation of...	2	One on 8th day .....	3	In 1 in a few hours, 2 on 5th day, and the 3rd on 12th
Guinea worm, or ulcers from	...	.....	16	In several the ulcers had cicatrised
Ulcers .....	3	.....	4	
22. Ankle, compound dislocation of	3	One on 7th day, another on 12th day		
Ankle, attempts to reduce supposed dislocation of	1			
23. Foot lacerated or crushed	16	Fifth day, 6th, 7th, 4 on 8th, 9th, 10th, 11th, 12th, 2 on 14th, 15th, 16th, and 1 month	14	In 8 period named : 6th day, 7th ; 2 on 8th, 2 on 10th, 1 on 12th and 15th
Foot wounded by bullet	2	One on 5th, the other on 11th day		
Feet or toes punctured by nails, splinters of wood, glass, &c.	24	In 21, period named ; in 2 soon, 2 on 5th day, 6th, 7th, 8th, 9th, 2 on 10th, 2 on 11th, 12th, 13th, 14th, 16th, 17th, and 21st. 3 healed—in 1 a piece of shoe found	36	In 21, period named : 6 on 4th or 5th day, 2 on 6th, 4 on 7th, 4 on 8th, 2 on 9th, 2 on 10th, and 1 on 14th

Parts wounded.	No. of Cases.	EUROPE. Period of occurrence.	No. of Cases.	HOT CLIMATES. Period of occurrence.
Feet burnt .....	2	One on 4th day		
Foot amputated .....		For disease of heel, 9th day; disease of bones, 13th; fracture, 5th. 1 healing		
Feet and toes, ulcers of	2	.....	4	
Feet, guinea worms in or ulcers from		.....	10	
24. Toes crushed .....	6	In 3, period named : 1 on 7th day, 9th, and 10th	12	In 8, period named : 2 on 4th or 5th day, 2 on 6th, 2 on 7th, 1 on 9th, and 1 on 18th
Toes amputated by axe	6	In 3, period named : 1 on 3rd day, 1 on 10th, and 1 on 14th		
Toe, great, compound dislocation of	2	One on 9th day		
Toe, great, amputa- tion of	2	One on 10th day		
Toes frostbitten .....	3	In 1 fingers also		
25. Arm, lacerated wounds of	12	Fourth day, 6th, 2 on 7th, 2 on 10th, 3 on 12th, 25th	4	
Arm, fracture, sim- ple, of humerus	4	In 3, period named : 7th day—heels also lacerated by saw; 8th —flesh contused, and 10th		
Arm, fracture, com- pound, of humerus	3	One on 2nd day	1	
Arm, fracture com- pound of radius and ulnar	6	Third day; 3 on 6th, 7th—gangrene, from separation being as- sisted, 6 days after	3	
Arm, amputation of	2	In 1, for compound fracture, 2nd day; in the 2nd for gan- grene from pressure in simple fracture	6	In 4 for gangrene, soon; 2 for com- pound fracture, with laceration; 1 for severe laceration
Arm, tumour, re- moval of	1			
Arm, operation for aneurism	1			
Arm, burns of .....	1			
Dislocation of wrist, compound	3	Fourth day, 5th—radius fractured, and 7th	1	



Parts wounded.	No. of Cases.	EUROPE. Period of occurrence.	No. of Cases.	HOT CLIMATES. Period of occurrence.
Injury of nerves.....	6	In 1, knot of whip imbedded in cubital nerve; in 4, nerves pricked or irritated; in 6, ulnar nerve wounded		
26. Hand lacerated or crushed	13	In 2 on 6th day; 3 on 7th; 3 on 10th, 11th, 12th, 15th, 21st, 26th, and 2 healed	9	In 8, period named: 1 on 4th day, 5th, 6th, 7th, 8th, 9th, and 18th, and 1 nearly healed
Hand bitten by female	1			
Hand burnt.....	3	Fourteenth day, 3 weeks, and 4 weeks	4	Fifth day, 8th, 9th, and 11th
Hand or fingers punctured with nails or splinters of wood	13	One day—wet the day before, 8th, 9th, 10th, 11th, 12th, 13th, 16th, 18th, 21st, 28th, 30th (wet on 26th), and 1 healed	10	In 8, period named: 6th, 7th, 8th, 10th, and 12th; 2 on 13th and 17th
Hand bitten .....	4	One on 8th, and 1 on 12th day	2	One by a monkey, the other by a rat
27. Thumb, fractured, compound	2	One on 11th day		
Thumb, dislocated, compound	2			
Thumb, abscess of ...	2			
28. Fingers or thumb fractured or crushed	18	In 12, period named: 2 on 2nd day, 2 on 5th, 2 on 6th, 2 on 8th, 10th, 11th, 12th, and 14th	9	In 7, period named: 5th day, 6th, 7th, 8th, 10th, 12th, and 13th
Fingers amputated...	5	In 4, period named: 4th day, 9th, 10th, and 18th		
Fingers lacerated.....	10	Sixth day, 7th, 9th, 10th, 12th, 13th, 14th, 16th, 17th, and 18th	7	In 1 on 4th day, 5th, 6th, 7th, 8th, 9th, and 14th
Fingers, incised wound of	4	In 1, on 3rd day—head injured before by fall on iron spike; in the other 2 healed	1	Sixth day
Fingers frost bitten	3	In 1, on 6th day—toes also affected		
Fingers cut off with axe	2	In 1, soon, from plunging arm into cold water; in 2nd, on 16th day		

(8.) *Influence of state of wounds.*—The wounds may present various states: 1st, Inflamed or extremely painful; the latter was frequently noticed when they were punctured; 2ndly, Suppurating; the pus healthy and copious, or thin and copious, and sometimes foetid; in some cases the suppuration ceased before or on the appearance of the disease, and the wounds became dry and puffy; 3rdly, Sloughing or unhealthy; in some cases the sloughing was extending; in others the slough was separating; in others it had separated, the wounds being red and irritable; 4thly, Gangrenous; the gangrene extending, or the line of demarcation formed; in the latter case, the disease sometimes followed interference with the knife; and in the former on amputation performed with the view of checking its progress; in several of the cases slight indications of the disease existed before the operation was performed; 5thly, Dry; 6thly, Healthy or healing; 7thly, Healed; in some cases for a few days, in others for one, two, or even three or four weeks.

Of 356 cases: in 45 of the number the wounds were inflamed; in several the adjacent parts were also affected; in 39 they were suppurating; in 82 sloughing or unhealthy; in 17 gangrenous; in 14 dry; in several the discharge had ceased suddenly; in 108 healing or healthy-looking, and in 52 healed.

TABLE SHOWING THE STATE OF THE WOUNDS IN 356 CASES OF LACERATED, CONTUSED, PUNCTURED, AND INCISED WOUNDS, AMPUTATIONS, WOUNDS OF JOINTS, FRACTURES, COMPOUND, AND COMMINUTED, OR WITH LACERATION, COMPOUND DISLOCATIONS, BURNS AND SCALDS, AND ULCERS.

	Wounds, lacerated or contused ulcers, burns or scalds.	Wounds Punctured.	Fracture, compound or comminuted, or with laceration.	Compound Dislocations.	Wounds of Joints.	Incised wounds, generally operations.	Amputations.
1. Inflamed .....	10	12	11	4	} 6 {	1	1
2. Suppurating ...	17	8	9	1		2	2
3. Sloughing or unhealthy }	48	4	19	1	2	3	3
4. Gangrenous ...	8	—	6	2		1	—
5. Healing, or healthy..... }	56	8	18	1	2	12	11
6. Dry .....	7	5	2	—	—	—	—
7. Healed .....	20	21	3	—	—	8	—
							12 amp. for gangrene 1 amp. for sloughing
Total.....	166	58	68	9	10	27	30

(9.) *Influence of abortion, labour, and diseases of the womb.*—1. *Abortion*—Aretæus, in his chapter on tetanus, states that women after abortion are liable to convulsions. An instance is recorded in one of the old medical authors. I have not been able to obtain the work.

Bajon saw it occur in a German female at Cayenne. She entered the hospital for flooding; an astringent was administered, and the discharge ceased suddenly. On the third day she went out early in the morning, but returned in a short time. She had scarcely got

into bed before convulsive movements set in, then trismus, and later tetanus, from which she sank in a few hours. Campet mentions a nearly similar instance. The patient, a German, was six weeks advanced in pregnancy, when she was taken with flooding. The discharge was arrested by astringents, and on the fifth day she was convalescent. She went out; in the evening she returned, and soon after getting into bed was seized with trismus; the next morning she had opisthotonos, and the next night she died. Dr. Jackson observed it at Calcutta, in a native—it proved fatal within thirty hours; and Mr. Peet at Bombay, in a native domestic; the disease appeared seven days after she had miscarried of a three months' fœtus; she lost much blood, and it was followed by fever; she died in three days. Dr. McLennen<sup>1</sup> saw it follow attempts to produce abortion.

In this country it has been observed by Drs. Wood, Malcolm,<sup>2</sup> and Fleming.<sup>3</sup> In Dr. Wood's case the patient, aged thirty-six, was taken on the 16th of November with flooding, when about three months pregnant. Acetate of lead and opium were given, and the vagina plugged; but the plug was removed at the end of two hours, as it excited severe pain. She recovered in the course of a few days. On the 23rd she complained of sore-throat, and on the 24th of trismus, with acute pain in the spine and rigidity of the abdomen.

<sup>1</sup> Transact. of Med. and Phys. Soc. of Bombay, 1840.

<sup>2</sup> Edin. Monthly Medical Journal, 1850.

<sup>3</sup> In Dr. Lawrie's Paper on Tetanus.



At six P.M. she had a tetanic spasm, and at seven P.M. a second. Tobacco injections were administered, and opium and Indian hemp given. Death ensued on the 26th at ten A.M. In Dr. Fleming's case the patient was thirty-six years of age, and mother of five children; she had miscarried when three months advanced in pregnancy, the hemorrhage was obstinate, but not copious. On the 7th day the discharge ceased rather suddenly, and soon after tetanic symptoms set in; they gradually increased in intensity, and she died on the third day. In the case observed by Dr. Malcolm, the patient had miscarried at an early period of pregnancy, and had quite recovered. About fourteen days after the miscarriage, she caught cold, and had inflammation of the tonsils. On the second day she was unable to move the jaw, and on the fourth, about noon, she was seized with general tetanic spasms; two hours afterwards she had a second attack, in which she died.

*Labour.*—During labour Arthaud<sup>1</sup> saw it occur in a negress aged fifteen, in labour with her first child, and Fournier-Pescay states that it occurred in one case “during severe labour.” In both the symptoms ceased after delivery. Arthaud's seems to have been a case of puerperal convulsions.

*After-labour.*—Arthaud<sup>2</sup> saw it occur in a negress who had been delivered of two dead children. She was progressing favourably, when, from exposure to the

<sup>1</sup> Dissert. et Obs. par le Cercle des Philadelpha, obs. ii.

<sup>2</sup> Ibid, obs. v.

weather, which was wet and stormy, tetanus set in, and death ensued in five days. Dr. Christie<sup>1</sup> saw it occur in a young native at Ceylon, two days after delivery; death ensued. He states that it was not unfrequent there. Dr. Jackson saw it occur at Calcutta, in a European, three days after labour, and prove fatal on the fifth day; and in a native, aged twenty, about five days after labour; she recovered. Mr. Peet, at Bombay, in a native, aged twenty-five; the disease appeared eight days after her confinement—she entered the hospital on the fourth day, and died on the fifth.

It has been observed in *Europe* by Forestus,<sup>2</sup> who saw it occur six days after labour—the lochial discharge was flowing; by Wahrendorff,<sup>3</sup> on the ninth—the labour had been difficult, the lochial discharge was flowing; by Desgenettes,<sup>4</sup> on the sixth day, from exposure to cold. Both Rush and Frank<sup>5</sup> place labour among the causes; Aubinas<sup>6</sup> states that it is more frequently observed among females in the country than in the towns. It generally appears after the lochial discharge has been suddenly suppressed by exposure to cold. In three cases which he met with, in two it occurred from this cause, in one with intense mental emotion, and in the third from drinking a pint of iced water. In one case the disease proved fatal; in one of those which re-

<sup>1</sup> Edin. Med. and Surgical Journal, vol. viii.

<sup>2</sup> Obs. Med., lib. x., obs. 112.

<sup>3</sup> Annal Wratislav, 1726.

<sup>4</sup> Fournier-Pescay.

<sup>5</sup> Prax. Med., lib. vii.

<sup>6</sup> Bullet. Gen. de Thèrapeut, 1849.

covered the symptoms had an intermittent type, and quinine was given with benefit. Two instances are recorded in the Registrar-General's Reports,<sup>1</sup> of tetanus occurring from labour. Hofer<sup>2</sup> saw it occur in a female about thirty-six years of age, three months after labour, from exposure to cold when in a state of perspiration.

*Diseases of the womb, &c.*—Dr. Simpson<sup>3</sup> saw it occur in a case a few days after a soft cellular polypus had been thrown off by the spontaneous efforts of the womb; the patient died in fifty hours. Dr. Storer<sup>4</sup> from retention of the placenta; the patient, aged thirty-eight, had had two children; she was delivered on the 20th of September of a full-grown child; the placenta adhered so closely to the uterus that it could not be detached. On the 23rd, the lochial discharge was very offensive; 26th, a piece of the placenta, of the size of a walnut was removed from the vagina, and two similar sized pieces were thrown off by two doses of ergot of rye; 27th, the pulse was 100, small and wiry; she had pain in the head, difficulty in swallowing, and stiffness of the jaw; the last symptom increased, and at eleven P.M. the tongue could scarcely be protruded between the teeth; she had frequently at irregular intervals tetanic spasms; the symptoms increased in severity, and she died in the night on the 28th. Volckamer<sup>5</sup> mentions

<sup>1</sup> Edin. Med. Monthly Journal, 1850

<sup>2</sup> Acta Helvet., 1751.

<sup>3</sup> Edin. Monthly Med. Journal, 1850.

<sup>4</sup> Amer. Jour. of Med. Science, 1842.

<sup>5</sup> Emph. Nat. Cur. 1687-278.

a case in which the patient received some injury, either of the vagina or womb, during labour with her first child. She had purulent discharge. At the end of three years she had recourse to the baths of the town where he resided. They were used for several days, when pain in the head and back set in; they increased in severity, and the whole body became rigid; she recovered.

(10.) *Influence of diseases of the brain and its membranes, of the cord and its membranes, and injuries of the nerves.*

1. *Diseases of the brain and its membranes.*—Rigidity with extension or contraction of the muscles of the face, jaw, neck, arms, legs, and trunk, is sometimes observed in apoplexy—inflammation of the membranes, particularly of the pia mata, acute softening of the brain, tumours, and abscesses. It co-exists with paralysis, and is seldom general, the muscles of the jaw, neck, of one arm, or of one side of the body being affected. The rigid parts are rarely the seat of convulsions; but the opposite leg or arm or side of the body are sometimes affected. Whether the cases recorded as tetanus by some writers do not belong to this class it is difficult, from the briefness of the histories, to determine. Bang<sup>1</sup> found blood on the surface of the brain in a young man who was taken first with trismus and then tetanus; in a child eight months old, whose body was quite rigid, and affected at irregular intervals with convulsive shocks, blood existed on both hemispheres between the pia mata and arachnoid, and the cerebellum was softened. This

<sup>1</sup> Acta. Reg. Soc. Med. Havniensis, 1792.



was considered to be a case of tetanus, although the evidence in favour of this opinion was very slight. It was insensible, the face pale, the pupils somewhat dilated and motionless; the whole body was rigid and extended, but during the convulsions the head was drawn back, and the body curved. Schumacher<sup>1</sup> states that a boy, aged eleven, who had fallen from a height, his head coming in contact with a stone, was brought into the hospital insensible and in a tetanic state. On recovering his senses he was found to be paralyzed; he recovered. Dr. Bright found an abscess in the brain in one instance, and ulceration of the under surface of the anterior lobes in another.<sup>2</sup> In the former case, the patient, a male aged forty-five, had, four weeks before his admission into the hospital, been struck on the head just above the ear by a brick. He had trismus, rigidity of the abdomen, and frequent tetanic spasms; a piece of bone was removed, and remedial measures employed with some benefit; erysipelas set in, and he died on the 28th day, apparently from the two diseases. In the second case, the patient, a female aged thirty, was taken, three days after she had received an incised wound over the extensor tendon of the thumb, with tetanus; before this she had injured her head by falling on an iron spike; to the latter accident the ulceration of the brain was attributed.

Dr. Wright<sup>3</sup> saw it occur in a negro three days after

<sup>1</sup> Med. und Chir. Bemerkung, 7<sup>te</sup> bemerk.

<sup>2</sup> Medical Reports, 271, and 279.

<sup>3</sup> Medical Observations and Inquiries, vol. 6.

sun-stroke; Dr. Otto<sup>1</sup> in a male, aged twenty-three, epileptic since childhood, of late the fits had increased in frequency, two severe accesses occurring daily; and Mr. Travers in a male who fell down in a fit while at work. On recovering his senses his lower extremities were paralysed, abdominal muscles rigid, and jaws closed; the muscles of the abdomen were frequently affected with spasms.

2. *Diseases of the Cord and its Membranes.*—(See *Acute Spinal Meningitis, Acute Inflammation of the Cord, and Changes found after Death.*)

3. *Injuries and Diseases of the Nerves.*—The disease has been excited by wounds of the supra-orbital nerve.<sup>2</sup> Frank and his father saw it occur from wounding and crushing the infraorbital; Odier<sup>3</sup> and Manget<sup>4</sup> from wounding the sub-maxillary; Mr. Poland<sup>5</sup> in a case in which the cheek had been lacerated and the malar bone fractured, found the portra-dura inflamed.

Benivenius<sup>6</sup> and Delaroche<sup>7</sup> saw it occur from wounding the nerves of the arm in bleeding; Dupuytren from the knot of a whip being imbedded in the cubital nerve; Hennen and Froriep from a piece of bone penetrating the radial nerve or one of its branches; Jacobi<sup>8</sup> and Holsher<sup>9</sup> from splinters of bone irritating the nerves of

<sup>1</sup> Caspar's Wochenschrift, 1836.

<sup>2</sup> Cerioli, An. Univer. di Med., 1829.

<sup>3</sup> Ploucquet.

<sup>4</sup> Frank.

<sup>5</sup> Case 17.

<sup>6</sup> De Abditis Morb. Caus.

<sup>7</sup> Jour de Méd., tome xl.

<sup>8</sup> Caspar's Wochenschrift, 1833.

<sup>9</sup> Hufeland's Journal, band. xv.

the arm ; Dr. Wilmot<sup>1</sup> found two of the nerves stretched over one of the extremities of the fractured radius ; Mr. Liston<sup>2</sup> in a case of lacerated hand, the branches of the median nerve torn and inflamed, and thickened for nearly an inch, and Mr. Poland<sup>3</sup> in a case of compound dislocation of the wrist, with fracture of the radius, the dorsal branches of the ulnar lacerated, injected, and swollen. Romberg mentions an instance in which it occurred from a piece of wood being driven into a nerve of the hand ; and Aberle<sup>4</sup> from one in the nerve of the finger.

Vetter<sup>5</sup> saw it occur from irritation of the par vagum by an ossified tracheal gland. Meyer<sup>6</sup> from irritation of one of the splanchnic nerves by ossification of the pleura. Frank saw it occur in two cases, "probably from irritation of the phrenic nerve." In one the patient had run a watchmaker's instrument into his chest ; inflammation of the lungs followed, and afterwards phthisis. In the last week of life he had rigidity of the neck, and before death opisthotonos. The second was a case of phthisis. Bonet<sup>7</sup> reports the case of a patient in whom the right side of the body became rigid. After death the right lung was found adhering to the walls of the chest, and containing tubercles ; the vessels of the head were congested, and the lateral ventricles contained serum.

<sup>1</sup> Dublin Med. Journal, 1848.

<sup>2</sup> Edin. Med. and Surgical Journal, vol. xxi.

<sup>3</sup> Case 47.

<sup>4</sup> *Algem. Zeitung für Chir.*, 1844.

<sup>5</sup> Plonequet.

<sup>6</sup> *Ibid.*

<sup>7</sup> *Sepulchret*, sect. xiii., obs. 18.

Franks' father saw it excited by irritation of one of the intercostal nerves ; it has occurred from shot being lodged in the intercostal spaces, and from tapping the chest for empyema. Beck mentions an instance in which it was excited by pieces of the vertebra irritating the spinal nerves.

When castration was an operation frequently performed, from the whole of the cord being generally included in the ligature tetanus was of frequent occurrence. Boerhave, Wepfer, Tulpius, Morand, Cavallini, Mursinna, Sabatier, Dennis, Rigal, Boyer, Travers, and several others, have recorded one or more instances. Dr. McArthur and Ruppius<sup>1</sup> saw it occur from a nerve being included in the ligature after amputation of a limb ; Beclard<sup>2</sup> and Travers from a ligature being applied to the sciatic nerve.

Mr. Ewbank saw it occur from puncturing the peroneal nerve. Mr. McFarlane in a case of compound dislocation of the ankle, found the posterior tibial nerve injured in several places, and the branches of the musculo-cutaneous and saphenic nerves dark and sloughy. Dr. Wilmot in a case of compound fracture of the tibia and fibula, the fibular nerve tightly stretched under the upper fragment of the fibula. Mr. Poland in a similar case (No. 32) found the end of one of the bones pressing against the posterior tibial nerve ; it was inflamed and softened ; and Dr. Beck in a case in which the fibula was shattered, two splinters of bone in the peroneal nerve. In a case of compound fracture of both bones of

<sup>1</sup> Friederich.

<sup>2</sup> Romberg.



the leg, observed by Mr. Travers, a spicula of bone penetrated the adjoining muscles, "but it could not be determined if the posterior tibial nerve had been injured."

(11.) *Influence of Diseases of the Organs of the Chest and Abdomen.*

1. *Of diseases of the organs of the chest.*—Morgagni<sup>1</sup> found the pericardium distended with serum in a male, aged twenty-six, who died with pleurosthotonos; both lungs were congested. Dr. Mackintosh,<sup>2</sup> in a middle-aged male, suffering from cough with expectoration, shortness of breath, tumultuous and irregular action of the heart, and spasmodic contractions of the muscles, sometimes bending the body backwards; found a large quantity of turbid serum in the pericardium, and lymph deposited on some parts of the heart; the brain and cord were healthy. Andral<sup>3</sup> in a female, aged twenty-six, admitted with symptoms of meningitis, who had for two days frequent retraction of the head and sudden contractions of the trunk, followed on the fourth day of her admission by the cessation of the delirium, but great feebleness, constant convulsions of the muscles of the face, and from time to time tetanic rigidity of the muscles of the arms; on the fifth the delirium returned, followed by coma and death, found the pericardium covered with albuminous concretions and containing several ounces of sero-purulent fluid; the brain and

<sup>1</sup> De Sed. et Caus. Morb. epist. x., art. 2.

<sup>2</sup> Practice of Medicine, 4th edition.

<sup>3</sup> Clinique. Médicale, tome iii., 32.

cord were quite healthy. Dr. Watson<sup>1</sup> has recorded the case of a male, aged twenty-four, in whom cerebral symptoms existed, with alteration of the heart's sounds, and who was taken before death with general convulsions, and occasionally with spasms of a tetanic character, in the intervals of which he was comatose; the pericardium was very vascular, and posteriorly it adhered to the heart over a space of two inches; a crop of little wart-like vegetations of the size of millet-seeds existed on the edge of the mitral valve; the aortic valves presented a similar change, the growths were however much larger; a little clear fluid existed under the cerebral arachnoid, and in the lateral ventricles, the cord was not examined. Andral<sup>2</sup> also reports the case of a male, aged twenty-one, who entered with cerebral symptoms on the 21st of April; on the 26th the head was drawn back and rigid, the eyes fixed and pupils somewhat contracted, the left one more than the right; he was agitated and uttered constant cries. On the 27th complete coma existed; but on the 28th it had disappeared, and he protruded his tongue when requested, but gave no other signs of intelligence. On the 30th the delirium and agitation returned. On the 1st May head again drawn back; on the 2nd it was carried alternately to the right and left, and from time to time the trunk and extremities were affected with tetanic shocks. The pericardium adhered to the heart throughout by false membranes; the lungs adhered to

<sup>1</sup> Medical Gazette, vol. xvi., 93.

<sup>2</sup> Clinique Méd., tome v., 83.

the sides of the chest by cellular adhesions; the right lung contained tubercles, and its bronchial tubes were red; the lateral ventricles were distended with serum, in which floated shreds of albumen, and each ventricle was lined by a delicate membrane, which could be detached. Ducros<sup>1</sup> observed inflammation of the superior aspect of the diaphragm and of the pericardium, in several places on its external surface, in a case of spinal meningitis; Dr. Bright,<sup>2</sup> inflammation of the right pleura, as it covered the ribs and extended over the diaphragm and right side of the pericardium, and up the side of the lung towards its root, the phrenic nerve passed down in the midst of intense inflammation, and on the diaphragm it was covered with shreds of false membranes; the left pleura was also inflamed, and the lungs where they rested on the diaphragm, particularly the right, were indurated; the lungs were congested, but quite crepitant; the skull and spine were not examined. The patient, a male, was taken with pain and swelling of the joints from exposure to cold, and on the fifth day with pain in the right side passing up to the shoulder, and full pulse; on the sixth with difficulty of breathing, increasing in severity, the pulse was quick and irregular, and in the evening with difficult deglutition and trismus; and on the seventh with opisthotonos, followed by convulsions of an epileptic character. In a lad under his care, suffering from rheumatism, with disease of the heart, there was a strong tendency to trismus; by the free ad-

<sup>1</sup> Clot: sur le Spinitis.

<sup>2</sup> Medico-Chir. Transact, 1839.

ministration of calomel, opium and antimony, he became convalescent, but the heart still continued very irritable.

2. *Influence of diseases of the organs of the abdomen.*—Abernethy<sup>1</sup> considered that local irritation may disorder the digestive organs, and induce the disease, when the wound was no longer irritable. Rush<sup>2</sup> places acrid matters in the intestines among the causes. Dr. Billing<sup>3</sup> mentions an instance where a purgative re-excited opisthotonos.

Dazille saw the disease excited in a man who had been drinking to excess, from the administration of an emetic — the stomach was found inflamed; and Andral,<sup>4</sup> in a middle-aged man, twenty hours after the commencement of inflammation of the stomach. Auvert<sup>5</sup> saw the body become quite rigid before death in a case of acute general gastritis; the same sometimes occurs in children suffering from acute softening of the stomach.<sup>6</sup> Plenciz<sup>7</sup> found the stomach and intestines gangrenous. Dr. McArthur, in one case the œsophagus, stomach and intestines inflamed, and the cœcum and colon sphacelated; in another the small and large intestines inflamed; and Regard,<sup>8</sup> inflammation of the gastro-intestinal mucous membrane. Aubinas states, that in a case in which the disease occurred after labour, inflammation of the gastric mucous membrane

<sup>1</sup> Surgical Observations.    <sup>2</sup> Med. Obs. and Enq.

<sup>3</sup> Practice of Medicine.    <sup>4</sup> Clinique Méd., tome i., obs. 42.

<sup>5</sup> Select. Prac. Medico-Chir., tab. xcv.

<sup>6</sup> Diseases of the Stomach and Duodenum, 36.

<sup>7</sup> Friederich.

<sup>8</sup> Thèse de Paris, 1834.



existed. Heurteloup<sup>1</sup> found the intestines distended with cherry-stones. Mr. Poland, intususeption of the ileum.

John Hunter observes that the disease "sometimes occurs during dysentery." De Haen, Celle, and Storch also observed it: and Trnka cites an instance from one of the early German medical journals.

The disease has been observed to occur in children suffering from worms. Trincavella<sup>2</sup> mentions an instance, and Trnka cites three others from different authors. Relief followed the expulsion of the worms. Laurent<sup>3</sup> saw the influence of worms in all the cases which fell under his notice. Larrey<sup>4</sup> considered that they had some connection with the disease, for he observes "that worms were found in the intestines of several of the patients opened." Dr. O'Biernie found ascarides in one out of three cases in which the stools were examined; and Pelissier states that of five cases which he saw recover, in two worms were passed; the symptoms declined from that time. Chaussier<sup>5</sup> saw the symptoms subside on the expulsion of worms, and Mursinna<sup>7</sup> a case of trismus cured.

Dr. Anderson saw a negro at Trinidad pass two large lumbar worms when the symptoms were declining; five days afterwards they had nearly disappeared.

Vantage saw a negress, aged twelve, pass, after the administration of an anthelmintic, a large number of worms, without relief. Dazille and Campet both state

<sup>1</sup> *Précès sur le Tetanos*, 1793.

<sup>3</sup> *Mem. Clinique sur le Tetanos*.

<sup>5</sup> *Thèse de Paris*, 1814.

<sup>7</sup> *Jour. für Chirurgie und Arzneykund*, band xx.

<sup>2</sup> *De Nat. Cur.*

<sup>4</sup> *Clinique Chir.*

<sup>6</sup> *Fournier-Pescay*.

that worms were common among the negroes ; but they did not seem to consider that they exerted any influence on the disease. Dr. Moorehead, from his observations at Bombay, states that although worms are very common among the natives, there is no connection between them and tetanus. Mr. Poland alludes to the existence of ascarides in the rectum in one of the cases. I have seen several cases examined after death, and consulted a large number of recorded cases in which the intestines were examined, generally no worms were found ; in those in which they were, they had evidently no influence on the disease.

Collison<sup>1</sup> has seen the disease occur after the application of caustic to a portion of the membrane remaining in the wound after the operation for hernia. Wepfer,<sup>2</sup> in a case in which the disease occurred after the operation for hernia, found the peritoneum inflamed.

Tulpius<sup>3</sup> mentions an instance of the disease occurring on ulceration of the bladder from stone ; and Hévin<sup>4</sup> one in which the patient complained before the symptoms appeared, of pain in the hypogastrium—the bladder was found inflamed.

#### CHANGES FOUND AFTER DEATH.

(1.) *In the traumatic form.*—The changes found in the *head and spine* seem to be but little influenced by the nature of the injury which has excited the tetanus, or by its duration, save that when life has been prolonged

<sup>1</sup> Acta Regiæ Soc. Havniensis, 1795.

<sup>2</sup> Bonet.

<sup>3</sup> Ibid.

<sup>4</sup> Thèse de Paris, 1823.

beyond six or seven days the brain and cord are sometimes found softened, and false membranes or sero-purulent fluid in the spinal canal. The manner in which death ensues, whether during an access of spasms or immediately afterwards, from asphyxia or coma, or from exhaustion, exerts considerable influence on the changes found after death; the two first and the last much less, however, than the two second.

Of thirteen cases in which death ensued *during an access of spasms, or immediately afterwards*: in three no changes were found in the brain or cord; in three other cases, in two of which the brain alone was examined and found healthy, in the third the brain was also healthy, but the spinal canal contained a preternatural quantity of serum; in the remaining seven cases the membranes of the brain and cord were injected; in three of these the cerebral arachnoid was rather opaque; in two others fluid existed under the cerebral arachnoid, but not to a large amount, and in the spinal canal; in the remaining two the brain and cord were congested, and serum existed in the ventricles. In a case observed by Dr. Bright the under surface of the anterior lobes of the brain was ulcerated; the cord was not examined.

Of seven cases in which death ensued from *exhaustion*: in one the brain and cord were healthy; in the remaining seven the membranes of the brain and cord were more or less vascular; in four of these a little serum existed under the cerebral arachnoid and in the spinal canal, in the latter the quantity was more copious; in a fifth, fluid existed in the lateral ventricles. In one

of the cases the anterior and middle lobes were softened ; in another the cord was softened.

Of nine cases in which death ensued from *asphyxia* or *coma*, the brain and its membranes were more or less injected in all ; the cord and its membranes in seven, but in the other two cases they presented no change. In four of the cases, fluid existed under the cerebral arachnoid, in the ventricles and spinal canal. In three, the medulla oblongata and cord were more or less softened.

The changes, found without reference to the manner in which death ensued, varied. In one set of cases, no changes were found in the brain and cord ; in a second, the brain and its membranes were healthy, but changes were found in the cord or its membranes ; in a third, the brain and cord were injected ; in a fourth, only their membranes ; in a fifth, injection of the membranes, with fluid in the skull and spinal canal ; in a sixth, injection of the membranes, and of the brain and cord, with fluid in the skull and spinal canal.

Thus, of eighty-one cases :—in thirteen, no changes were found in the brain and cord ; in seven, the brain and its membranes were healthy, but the cord or its membranes presented changes ; in fifteen, the brain and cord were injected ; in nineteen, the membranes of the brain and cord were injected ; in thirteen, the membranes of the brain and cord were injected, and fluid existed in the skull and spinal canal ; in fourteen, the membranes and substance of the cord and brain were injected, and fluid existed in the skull and spinal canal.

1. *No changes in the brain and cord.*—Sir



Benjamin Brodie, Mr. Travers, Dupuytren, and Cloquet, have seen cases in which the brain and cord were healthy. Dr. Bright found the brain and cord, and also the nerves of the wounded part, healthy. In six of the cases reported by Mr. Poland, the brain and cord were healthy; in one, the nerves of the wounded part were examined, and found healthy. In a case which occurred to Dupuytren, the only change found was the knot of a whip in the cubital nerve; in one to Mr. Liston, the nerves were torn across, and their extremities inflamed.

I have seen an instance in which the nerves, which were imbedded in inflamed tissue, were deeply injected.

2. *No changes in the brain or its membranes, but changes in the cord or its membranes.*—This was observed in seven of the cases. In four of the number, the cord was more or less congested; in two of these, the membranes were injected, and the spinal canal contained serum. In the remaining three cases, the cord was healthy, but the canal contained serum, or sero-purulent fluid. The state of the nerves was noted in three of the cases: they were injected or thickened, and in one of the cases injection existed in other parts of the nerves than at the wound.

3. *Brain and cord injected.*—This was observed in fifteen of the cases. In one of the cases, pus existed on the cerebral dura mater,—the patient had had his skull fractured; in a second, the medulla oblongata and cord were softened; in a third, the cord was softened; in a fourth, false membranes were found in the spinal canal; in a fifth, serum; and in a sixth and seventh blood

external to the dura mater. The state of the nerves was noted in four of the cases: in three, they were inflamed; in the fourth, they had been divided; their extremities were bulbous.

4. *Membranes of the brain and cord injected.*—

This was observed in nineteen of the cases; in one of the number only one side of the membranes of the cord were affected. In one of the cases the anterior and middle lobes of the brain were softened, and the cord in parts; blood existed external to the spinal dura mater; in a second, the cortical substance of the brain was dark-coloured. In three of the cases the cerebral arachnoid was rather opaque. In one case, fluid existed in the ventricles, and in another the cord was injected. In eight of the cases the state of the nerves were noted; in one, they were healthy; in five, inflamed; in the seventh case, the ischiatic nerve was injected, but the state of the nerves at the injury, which was in the foot, is not stated; in the eighth, a case of puncture of the hand, the wound had healed some days before the disease appeared, the median nerve is stated to have been "rather yellow."

5. *Membranes of the brain and cord injected.*—*Fluid in the skull, and in the spinal canal.*—

This was observed in thirteen of the cases. In two of the number the membranes of the brain were rather opaque, and in one blood existed in the spinal canal. In three of the cases the lateral ventricles contained serum. In four of the cases the state of the nerves were noted: in two they were inflamed; in the other two the ischiatic nerve was

inflamed ; the injury was in the thigh in one instance, in the other at the ankle.

6. *Brain and cord and their membranes injected.—Fluid in skull and spinal canal.*—This was observed in fourteen of the cases. In four of the cases fluid existed in the ventricles. In one case the cord was softened.

In six of the cases the state of the nerves was noted ; in two, they were healthy ; in the third, their neurilemma was injected ; in the fourth, inflamed ; in the fifth, dark and sloughy at the injury, and injected above ; in the sixth, two of the nerves of the limb were injected.

Dr. Aitken<sup>1</sup> in four cases found that the specific gravity of the spinal cord was increased in tetanus. He observes "that a change is suddenly indicated about the region of the cord, which is in immediate communication with the wounded part, and that in idiopathic tetanus the change is uniform throughout. In one case, where the wound was on the occiput, the uppermost three inches were of the highest specific gravity, and the difference became suddenly manifest at the fourth inch." In another case, "the difference was suddenly marked where the roots of the cervical and first dorsal nerves left the cord to form the brachial plexus ; the wound was on the finger. In the last case, the difference was suddenly manifested in the lowermost part of the cord, corresponding to the region where the nerves were in communication with the lower limbs, which were the seat of the injury."

<sup>1</sup> In Dr. Lawrie's Paper.

7. *State of the nerves—Of the sympathetic.*—Lobstein<sup>1</sup> found the semilunar ganglia injected; Mr. Macaulay<sup>2</sup> the right one injected, the left one containing a few vessels; Mr. Swan all the ganglia firmer than usual in one case, in another enlargement and increased vascularity of the semilunar ganglia, and of all the ganglia in the chest, and of several of those in the abdomen in a slighter degree; in others there was no alteration. The par vagum at the root of the right lung was vascular. Dr. Aronsohn<sup>3</sup> found the semilunar ganglia inflamed, and Dupuy<sup>4</sup> has frequently observed them inflamed and disorganized in animals.

In a case recorded in the eighth volume of the *Medical Gazette*, the first cervical ganglia were more vascular than usual. Mr. Curling found the cervical ganglia unusually vascular, but in another case they were healthy; Hip. Larrey the ganglia injected in the immediate vicinity of the nerves passing from the scapula, which had been fractured. I have seen the sympathetic nerves examined in two cases: in one, the ganglia along the spine were injected, the spinal nerves were similarly affected, and the membranes of the cord the same; in the other they were quite healthy, and the cord and its membranes were the same. Dr. Bright found the sympathetic nerve quite healthy.

*Of the spinal nerves.*—In several of the cases the nerves were healthy; in others no nerves could be traced

<sup>1</sup> De Nervi Sympath. Humani.

<sup>2</sup> Mr. Swan.

<sup>3</sup> Mr. Curling.

<sup>4</sup> Encyclop. Methodique, cited by Mr. Curling.



in or near the wound ; in others again they were divided, sometimes they presented no indications of inflammation ; sometimes their extremities were united by coagula of blood or lymph ; sometimes their extremities were bulbous ; sometimes they were injected and thickened for a short distance ; sometimes injected for a considerable extent or in parts ; sometimes, when the inflammation was extensive in the limb, one or more of the nerves were inflamed throughout.

In sixty-four cases the state of the nerves was noted.

In twenty-two of the number the injuries were either lacerations or contusions, generally of the hands, fingers, feet, or toes. In six the nerves of the injured parts were healthy ; in the remaining sixteen they were lacerated and inflamed, and in seven the trunks were more or less injected.

In fourteen of the cases the injuries were either compound, or comminuted fractures. In two of the cases the nerves were healthy ; in the remaining twelve inflamed—inflammation or injection existing in eight for some distance above the injury.

In six cases, in which the injuries were compound, dislocations of the ankle, great toe, or thumb, the nerves were lacerated and inflamed at the seat of the injury, in two for some distance beyond.

In five cases in which the disease occurred after amputation, in two the nerves of the stump were healthy, in the remaining three inflamed.

In four cases, in which it occurred after burns or scalds, the nerves were healthy in one of the cases ; in

the remaining three inflamed at the point of the injury, and for some distance above.

In ten cases in which it occurred after punctured wounds, in four the nerves were healthy; in the remaining six they had been punctured, or splinters of wood were either fixed in or irritated them.

In three cases in which it occurred after simple fracture, in one the nerves were healthy; in the other two no alterations could be detected in the nerves, yet the muscles had been lacerated and irritated by the extremities of the bone.

8. *Changes in the organs of the chest and abdomen.*

—The lining membrane of the larynx, trachea, and bronchia is frequently congested and covered with mucus, the larynx is sometimes found closed; in one of the cases contained in Mr. Poland's paper, the epiglottidian folds were loose and caught in the rima, closing the larynx.

The lungs are frequently gorged with blood, and sometimes blood is effused into their substance in a greater or less quantity; occasionally they are collapsed, or more or less emphysematous, œdematous, or indurated.

The heart is sometimes found distended with blood on both sides; sometimes only on the right side, the left being empty; sometimes both sides of the heart are empty, and if the post-mortem examination has been made soon after death the heart will be found reduced in size, and extremely dense and hard.

The diaphragm is sometimes found contracted. I have observed it, however, in only one instance. The

post-mortem examination was made soon after death. The contraction did not continue long.

The pharynx and sometimes the œsophagus are found injected, inflamed, and sometimes contracted. The same appearances have been observed in the stomach and intestines.

The liver is frequently congested; in hot climates it has been found inflamed, or the seat of acute or chronic abscess. Mr. Poland found the spleen congested, or large and soft, in some cases; in others it was quite healthy. In hot climates and in marshy districts it has been found enlarged. This, however, was due to malaria, and not to the disease.

Inflammation of the peritoneum has been observed in two cases; both had been operated on for hernia.

In only one instance was the womb examined after death in the patients who died from the disease after labour or abortion. In this case it occurred after abortion; "the uterus was about two and a half inches in length, and of corresponding breadth, empty, and more flaccid than natural."<sup>1</sup>

The kidneys are sometimes congested.

The muscles, particularly the recti abdominales, the psoæ, and those of the spine, are frequently ruptured and blood effused into their substances.

2. *In idiopathic tetanus*.—Changes (except the disease arises from inflammation of some of the organs, and even in these in some cases) are found in the mem-

<sup>1</sup> Dr. Fleming's case.

branes of the cord and in the cord. In the former they consist, first, of congestion, with effusion of serum; secondly, of opacity, false membranes, pus or sero-purulent fluid; in the latter of congestion or softening. See *Spinal meningitis*.

#### GENERAL SYMPTOMS OF TRAUMATIC TETANUS.

It occurs under two forms:—1, *acute*; 2, *chronic*; and as *general* and *partial*. The acute form occurs much more frequently than the chronic, and the general than the partial.

It may set in at any period between the infliction of the wound and its healing, or re-establishment of the health. It sometimes occurs just as the wound has healed, within a week or twelve days afterwards; in a few instances not for three or four, or even five weeks; in one recorded by Mr. Ward,<sup>1</sup> it did not appear until the tenth week. In these cases the wound seems to have but very little influence in exciting the disease, exposure to cold, or wet being the exciting cause. The disease is more liable to occur between the sixth and fourteenth day than at any other period; for out of 343 cases which I have examined, in 223 it occurred between these periods, and in ninety-four of these it set in from the sixth to the eighth day inclusive.

<sup>1</sup> On Hydrophobia and Tetanus, &c



The following table will show the period of the occurrence of the disease in the 343 cases :—

Within six, twelve, eighteen or twenty-four hours...	12
From 1 to 2 days .....	12
„ 3 „ 5 „ .....	37
„ 6 „ 8 „ .....	94
„ 9 „ 11 „ .....	77
„ 12 „ 14 „ .....	52
„ 15 „ 17 „ .....	25
„ 18 „ 20 „ .....	9
„ 21 „ 23 „ .....	9
„ 24 „ 26 „ .....	6
„ 27 „ 29 „ .....	9
„ 30 „ 32 „ .....	1

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343

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In the cases in which the disease occurred within a short time after the receipt of the injury the cause in cases of fracture was irritation of the muscular tissue or nerves, from being carried a long distance or badly put up; in cases of bullet or shell wounds, from being conveyed a long distance and exposure to cold, wet, or currents of cold air; in cases of amputation, from the parts being in a highly sensitive state, or from a predisposition to the disease existing before the operation was performed, including a large nerve in the ligature, sudden violent mental emotion. Traction of an exposed tendon has been known to excite tetanic spasms in two cases. In one case recorded in the *Archives Général*

*de Médecine* for 1828, it was the tendon of the peroneus longus muscle ; it had been laid bare by ulceration. Severe pain was excited, which lasted for ten minutes with vomiting and faintness, followed by unconsciousness, rigidity of the jaws, neck and abdomen, contractions of the muscles of the face, fixing of the eyes, convulsive flexion of the legs, and hard quick pulse. The patient was bled largely and thirty leeches applied, but without effect. A warm bath for one hour, followed by mercurial frictions and a blister to the neck, which was dressed with morphia, were then employed. The next day the trismus had ceased, but the rigidity of the neck continued. By applying a larger quantity of morphia to the blistered surface the rigidity soon ceased.

In a case which occurred to Dr. Robertson,<sup>1</sup> the patient, a negro waiter, cut his face with a piece of china plate ; he was seized immediately afterwards with tetanic spasms, and died in a short time. Dr. Randolph<sup>2</sup> saw tetanic spasms set in almost immediately after a sting on the cheek from a bee ; relief followed on the occurrence of vomiting. I have seen them occur in a sensitive but not hysterical female from running a needle into the finger. They followed the accident immediately. The body and extremities were rigid, mouth closed and the jaws fixed, the eyes the same. At short intervals the whole body was affected with convulsive shocks ; the administration of a dose of chloro-

<sup>1</sup> Rees's Encyclopædia, art. Tetanus.

<sup>2</sup> Medical Recorder, 1828.

form removed them, but the back and neck remained rigid for three days.

1. *Symptoms of the acute form.*—The disease varies considerably in its mode of commencement. In some cases it is preceded by fever and delirium, or great irritability and sensitiveness to noise, or languor and drowsiness ; in others by severe pain in the wounded part shooting up to the axilla or spine when the wound is in the upper extremity ; to the pelvis or up along the spine to the neck when in the lower. In most cases, the first symptoms of the disease appear in the face, throat, or neck. In the first, the eyebrows are knitted from contraction of the corrugator muscles, the corners of the mouth drawn down from contraction of the depressors, and the other muscles more or less rigid and contracted. Sometimes the rigidity and contraction is preceded by spasmodic twitchings, transient at first, but increasing in severity. Sometimes the two exist together. In the second, the patient complains of huskiness and slight difficulty in swallowing. In the third, of difficulty in moving the head, from a feeling of stiffness in the neck, sometimes of wry neck. The symptoms in the face increase in severity ; the jaw, at first moved with difficulty, becomes, from contraction of the masseter muscles, closely locked, and the features undergo a marked alteration from increased contraction of the muscles of the face ; the difficult deglutition increases, saliva pours from the mouth, and in a more advanced stage attempts to drink excite attacks of spasms. The rigidity of the neck increases, it extends to the back, walls of the chest,

abdomen, and upper and lower extremities ; there is often severe pain in the back, with great constriction or pain under the lower part of the sternum, and in the course of the attachments of the diaphragm. To these symptoms are soon added attacks of spasms, which, in some cases, consist of shocks ; in others, of an increase in the state of rigidity ; during which the head is drawn still further back, the spine more curved, the patient resting on the heels and occiput, the body being at the same time more or less convulsed. These attacks of spasms vary in duration from one or two minutes to five or fifteen ; they occur at irregular intervals, and are often excited by attempts to move, sudden noise, attempts to swallow ; and when the sensibility of the cutaneous surface is increased, by pinching the skin, applying the hand or cold to it. The accesses are attended with a great increase in the severity of the pain. In a case recorded by Sir Gilbert Blane, the accesses were, however, attended by feelings of pleasure, and the patient had a strong tendency to laugh. In some cases the rigidity is the most marked symptom, in others the spasms, the patients in the intervals being able to open the mouth, and swallow, and move the limbs. In most cases the rigidity precedes the spasms, but in some the spasms, the face or injured extremity being first affected, then the rest of the body. Occasionally, at the onset, rigidity exists in one part, while another is affected with spasms. The skin is generally hot and covered with perspiration ; the latter frequently excites miliary eruption. The pulse varies ; if the heart remains unaffected, or the



spasms not severe, it is often not increased beyond ten or fifteen beats ; but if the former is implicated, or the latter severe and frequent, then it will be either very quick or very slow : the former is much more frequently observed than the latter. I have observed the heart act at the commencement of the access of spasms with great rapidity and force, becoming, as it advanced, irregular, and at last nearly imperceptible ; as the spasms subsided, it became first irregular, and some time after the access regular, but beating with great rapidity. The breathing is greatly oppressed, from rigidity of the walls of the chest and sometimes from contraction of the diaphragm, or closing of the opening of the larynx, it is arrested during the height of the paroxysms. The voice is altered, the patient complains of severe constriction in the throat, the hand being carried to it, and during the accesses efforts are made to remove some obstruction. The accesses cease during sleep, but they are frequently so severe as to prevent the patient's doing so. Sometimes the attacks diminish or cease from exhaustion of the nervous powers, but as soon as they are recruited by a short sleep they recommence with increased severity.

The bowels are obstinately confined, the motions generally dark-coloured and very offensive, the urine high-coloured and scanty, the thirst severe from the increased action of the skin.

As the disease progresses to a fatal termination, the breathing becomes more and more oppressed, mucus accumulates in the bronchia and trachea ; the lungs, if they can be examined, will be found congested ; coma,

more or less pronounced sets in, sometimes the accesses then diminish in severity and frequency, but at others, they assume an epileptic character; sometimes the breathing or the action of the heart during the accesses becomes more and more oppressed, and the patient expires; sometimes the accesses and the rigidity cease, and the practitioner flatters himself that the disease has disappeared. This state sometimes continues for only a few minutes; sometimes for one, two, three, or four hours, the patient expiring while attempting to sit up or turn in bed, or from an access of spasms, generally not of a very severe character.

The muscles of both sides of the body are generally equally affected, but in a few instances those of one side are more contracted than the other, curving the trunk to one side, this state may exist throughout, or occur only during the accesses; the muscles of the neck are more liable to be affected than those of the trunk. In a few instances, the disease has been confined to one side of the body. In the few cases recorded, the wounds or injuries were on the same side.

2. *Symptoms of the chronic form.*—This form is very seldom observed. In it the symptoms are generally confined to the muscles of the face and jaw, neck or back, except when it occurs—a somewhat rare circumstance—as a termination of the acute, then it is more or less general. Rigidity is the most prominent symptom, the accesses of spasms being either absent or slight in character, and occurring at long intervals; the appetite is good, the pulse calm, and the general health

but little affected. It has been observed to pass into the acute and terminate fatally, often in a short time. In some cases this has taken place without any assignable cause; in others, from exposure to cold and wet, over-fatigue, fits of passion, fear, mental excitement, or fresh wounds.

#### SYMPTOMS OF THE IDIOPATHIC FORM.

The general symptoms are the same as those observed in the traumatic form. Except in cases in which the disease occurs as a result of disease of some organ, it invariably depends on active congestion or inflammation of the membranes covering the cord, particularly the pia mater, or of the cord itself. (See *Acute inflammation of the pia mater of the cord, and of the cord.*)

#### RELAPSES.

The disease has been known to return. First, during convalescence, from exposure to cold or wet, or from fatigue. Dupuytren mentions an instance in which it returned twenty-eight days after it had disappeared, from exposure to cold; and Campet, one in which it returned from the same cause several times. Secondly, from mental emotion. Mr. Key has recorded a case in which a fit of passion caused it to return, and prove immediately fatal, by inducing spasms of the heart. Thirdly, from irritating the wounded parts by applications or by attempting to extract pieces of loosened bone or

foreign bodies. Fourthly, from amputation, particularly when it has been performed near the wound, the incisions being made through inflamed tissues, or from including filaments of the nerves in the ligature.

The disease has been observed to assume an intermittent and periodical character. In the former case it has generally occurred in aguish districts, or in connection with ague; in the latter, about the time of the appearance of the menstrual discharge, or in connection with hysteria or epilepsy,

#### TERMINATION.

1. *Of the traumatic form.*—Of about twenty cases seized with the disease after the action off Guadeloupe<sup>1</sup> only three recovered; and of forty or fifty in the Madras Hospital after the action off Cuddalore,<sup>2</sup> only one. Mr. Peet states, that of 120 cases admitted into the Native Hospital at Bombay eighty-seven died; of twenty stated to be traumatic admitted into the Male and Female Hospital of the Medical College, Calcutta,<sup>3</sup> seventeen; of fifty admitted by Dr. Jackson into the Native Hospital, thirty-five. By the use of chloroform, hemp and aloes, with a nourishing diet, this gentleman obtained a more favourable result, losing only five out of twelve cases. Dr. Dickson states, that the six or seven

<sup>1</sup> Sir Gilbert Blane.

<sup>2</sup> Curtis.

<sup>3</sup> From Reports of Medical College.



soldiers seized with the disease after the attack on New Orleans, died on the second, third and fourth days.

In the Peninsular war, the disease seems to have generally terminated fatally. Dr. O'Beirnie states, that of 200 cases which fell under his notice not one recovered, and Sir James Macgregor observes—"that of several hundred cases there were very few when the disease had made any progress in which remedies seemed to have any effect."

Of six cases which occurred among the troops employed in Spain<sup>1</sup> under Sir De Lacy Evans, five died; and of six cases observed at the siege of Antwerp,<sup>2</sup> five.

In the Crimea.<sup>3</sup>—Of the thirty cases which occurred among the French wounded, all died.

Of forty-nine cases contained in Dr. Laurie's table, in forty-two the termination was fatal, one was removed from the hospital in a dying state. Of sixty cases which occurred in Guy's Hospital, Mr. Poland states that in twelve the patients were females, and the disease terminated fatally in all; in forty-eight males, death ensued in forty-five of the number. It proved fatal in seven out of eight cases which I have had the opportunity of observing. The recorded cases show a much more favourable termination. Thus, out of 276 cases recorded in the different European journals and surgical works, the disease terminated fatally in only 148 of the number.

2. *Of the idiopathic form.*—Both Dr. Morehead and

<sup>1</sup> Mr. Alcock.

<sup>2</sup> Hip. Larrey.

<sup>3</sup> Scriver.

Mr. Peet consider, from their observations on the disease in the Native Hospital at Bombay, that this form is quite as fatal as the traumatic. The latter gentleman states that, of seventy-five cases admitted, the disease terminated fatally in fifty-seven. He also observes that several of the cases entered as traumatic were, strictly speaking, idiopathic.

At Calcutta, of six cases given by Dr. Jackson, four proved fatal; and of twenty-one which entered the hospital of the Medical College, twelve.

Of three cases Mr. Poland states, which occurred at Guy's Hospital, two recovered; of nine mixed cases, idiopathic and traumatic, five. Of two cases which occurred in the Glasgow Infirmary one recovered. The published cases of idiopathic tetanus in the different European medical journals and medical works seem to show that it is less liable to terminate fatally than the traumatic form; for, out of forty-one cases which I have examined, a fatal result ensued in only seventeen of the number.

In military practice, without reference to the form of the disease, it seems more liable to terminate fatally in some parts of the world than in others. Thus, at Jamaica, of twelve seized with the disease ten died; in the East Indies, nine out of thirteen; in the Windward and Leeward command, thirty-five out of forty-seven; in Ceylon, twenty out of thirty-one.

It may terminate fatally in several ways. First, by spasms of the muscles of respiration, larynx, or heart—this seems to be its most frequent mode of termination,

for this was the manner in which it terminated in forty-five out of ninety-eight cases. In the majority of the cases it occurred during an access of general spasms; in a few the access had ceased, but the contraction of the opening of the larynx, or of the muscles of respiration or of the heart, continued; in a few the spasms were more marked in one or other of these than in the other parts of the body. Secondly, from exhaustion: death ensued from this cause in twenty-five out of the ninety-eight cases; in some of the cases the patients were worn out by the loss of sleep, inability to receive nourishment, and the spasms; in several this was evidently due to the too free use of the lancet, or the non-administration of nourishment. In some of the cases the accesses, and sometimes the rigidity and contraction, ceased before death took place. In seven of the ninety-eight cases, death ensued from asphyxia, consequent on the accumulation of mucus in the air-tubes; in eight from convulsions of an epileptic character; in eleven from coma, in three of this number from the excessive administration of large doses of opium, or its preparations, and in two others from the too free administration of chloroform. In the three remaining cases—in one it ensued from diarrhœa, one from phlebitis, and one from continued fever.

Mr. Poland states that, out of forty-six cases which occurred in Guy's Hospital, and in which the mode of dying was noted, in nineteen it occurred during a paroxysm, in thirteen from asphyxia and suffocation, in ten from exhaustion, in two from exhaustion and

spasm, in one from tetanus and erysipelas, in one from coma, probably from a large dose of morphia.

In Bombay the termination was more fatal in some years than in others, as will be seen from the following table :—

	NO. OF CASES.	NO. OF DEATHS.	RECOVERIES.
1845 <sup>1</sup>	23	12	11
1846	30	24	6
1847	30	18	12
1848 <sup>2</sup>	28	19	9
1849	19	15	4
1850	35	20	15
1851	38	23	15
1852	34	23	11
1853	50	27	23

When the disease terminates favourably the restoration to complete health is generally tardy. It occasionally leaves some amount of rigidity and paralysis.

#### DURATION.

It has proved fatal in a short time. In the case observed by Dr. Robertson, death ensued in fifteen minutes from the infliction of the wound. In one of the cases contained in Mr. Poland's table, it terminated fatally in "four or five hours;" in one of Lepelletier's

<sup>1</sup> From Mr. Peet's paper.

<sup>2</sup> From Dr. Morehead's work.



cases in a few hours; in one of Dr. Jackson's in twelve; in one contained in Dr. Leith's Reports in eighteen; and in one observed by Mr. Curling in nineteen. It frequently proves fatal at the end of twenty-four hours, but it is more liable to do so from the first to the eighth day, particularly from the third to the fifth, than at any other period.

The average duration of the disease is the same both in Europe and in the East Indies.

Of ninety-eight cases of the *traumatic form* which terminated fatally in Bombay, in twenty, death ensued from one to two days inclusive; in thirty-four, from the third to the fifth; and in twenty, from the sixth to the eight—in all seventy-four cases. Of thirty-nine cases of the *idiopathic form*, fifteen of the number proved fatal from the third to the fifth day inclusive.

Of forty-one cases of the *traumatic form* contained in Dr. Lawrie's table, thirty-one proved fatal from the first to the fifth day inclusive; of sixty-two in Mr. Poland's, thirty-seven from the third to the eighth day inclusive; and of one hundred and thirty recorded cases, ninety-eight from the first to the eighth day.

It has been known to continue beyond the third and fourth week. Paillard, one of the editors of Dupuytren's "Traité des Blessures," and Hennen to the end of six weeks; in the case observed by the latter death ensued from fever; in another case he states that it lasted seven weeks. In one of the cases contained in Dr. Leith's Reports, it did not prove fatal until the forty-fourth day.

TABLE, SHOWING THE DURATION IN THIRTY-NINE FATAL CASES OF IDIOPATHIC TETANUS AND NINETY-EIGHT TRAUMATIC, WHICH OCCURRED AT BOMBAY, COMPILED FROM DR. LEITH'S RETURNS AND CASES CONTAINED IN MR. PEET'S PAPER.

	Idiopathic.	Traumatic.
From 6 to 12 hours .....	—	—
From 12 to 24 hours .....	—	1 (18 hours)
1 day .....	2	6
From 1 to 2 days inclusive	5	20
From 3 to 5 days „	15	34
From 6 to 8 days „	4	20
From 9 to 11 days „	3	7
From 12 to 14 days „	4	2
From 15 to 17 days „	1	2
From 18 to 20 days „	1	1
From 21 to 23 days „	1	1
From 24 to 26 days „	—	—
From 27 to 29 days „	2	3
From 30 to 32 days „	1	—
Beyond 32 days .....	—	1 (44 days)
Total.....	39	98

TABLE SHOWING THE DURATION OF FORTY-ONE FATAL CASES OF TRAUMATIC TETANUS CONTAINED IN DR. LAWRIE'S PAPER, OF SIXTY-TWO IN MR. POLAND'S, AND OF 133 OCCURRING IN CIVIL PRACTICE IN EUROPE.

	Dr. Lawrie.	Mr. Poland.	Collected Cases.
Within 6 hours .....	—	1 (4 or 5 hours)	1
From 6 to 12 hours ...	1 ( $\frac{1}{2}$ day)	—	1
From 12 to 18 hours ...	—	1	—
From 18 to 24 hours ...	—	—	8 ( <sup>7</sup> to 24 hours)
From 1 to 2 days inc.	17	10	30
From 3 to 5 days „	14	20	36
From 6 to 8 days „	5	17	32
From 9 to 11 days „	4	2	4
From 12 to 14 days „	—	4	6
From 15 to 17 days „	—	1	2
From 18 to 20 days „	—	1	2
From 21 to 23 days „	—	3	5
From 24 to 26 days „	—	—	2
From 27 to 29 days „	—	1	2
From 30 to 32 days „	—	1	2
Total.....	41	62	133

## PROGNOSIS.

The prognosis must always be unfavourable, both in the traumatic and idiopathic forms; but patients sometimes recover under the most unfavourable circumstances.

The following may be, I think, considered as certain indications of a fatal result:—

1st. The disease occurring after compound or comminuted fracture, severe laceration, inflammation or gangrene of the hand (if extensive), arm, foot (if extensive), leg, or thigh; after, or if developed by, amputation of the arm, leg, or thigh, or any other severe operation.

2ndly. When it is developed—no matter how slight or how severe the injury—with great rapidity, the accesses being severe and frequent, the respiration difficult, the constriction in the throat and epigastrium severe, mucus accumulating in the bronchia, the action of the heart during the accesses interfered with, the pulse increasing in frequency and beating 140 or 150 in the minute, or being under 50 or 40, and very feeble; the accesses assuming an epileptic character, or delirium or coma appearing.

3rdly. The sudden cessation of the symptoms.

4thly. The remedies, such as morphia, tincture of opium, tobacco enemas, or chloroform inhalations making but very little impression on the disease.

The circumstances which may justify the practitioner in looking forward to a favourable result are—

1st. The disease being slowly developed; rigidity

being the principal symptom ; the diaphragm, larynx, and heart being unaffected ; the accesses of spasms absent or very slight.

2ndly. The severe symptoms subsiding gradually ; or, if rapidly, the patient continuing free for twelve hours.

3rdly. The patient living beyond the twelfth or fourteenth day, particularly if the constitutional powers are not reduced.

Cases which promise to terminate favourably sometimes end fatally, from the sudden development of severe symptoms—sudden spasm of the heart or of the larynx. Even when convalescence has been more or less established, exposure to cold, fear, or a fit of passion, has re-excited the disease, and it has proved fatal.

#### DIAGNOSIS.

The only disease likely to be confounded with tetanus is hydrophobia. The difficulty in swallowing, the flowing of saliva from the mouth, the great sensitiveness to noise or the motion of an object, and the predominance of the accesses of spasms over the rigidity, may induce such a mistake.

Mr. Poland states that one of the cases admitted into Guy's Hospital "was supposed by some to be hydrophobia from its severity, but was disproved." "Two cases," he observes, "were mistaken for rheumatism previous to admission. They were both subacute, and recovered."



## TREATMENT.

1. *By amputation.*—It has been performed with success in some cases, in others with only temporary relief; in a few, the operation neither diminished nor aggravated the symptoms; while in others the operation caused the symptoms to be developed with greater rapidity, and death in some to take place immediately or in the course of a few hours.

It is impossible to determine under what circumstances the operation is likely to be of service. If the disease is partial, or not acute, or if it depends on local irritation, it is *likely* to be followed by relief; but it seems necessary that the amputation should be performed at such a distance from the wound as to avoid irritating the already inflamed or irritated structures.

The testimony is more pronounced against amputation than for it. Mr. Wood,<sup>1</sup> surgeon to the Jamaica Hospital, tried amputation of the wounded parts in cases of tetanus following wounds of the fingers and toes, but without effect. Mr. Abernethy<sup>2</sup> states that he repeatedly amputated in cases of crushed fingers, but without doing more than mitigating the symptoms. Mr. Curtis observes that amputation was tried in the Madras Hospital without success. It was tried in the Peninsular war<sup>3</sup> with a like result. Sir James Macgrigor states

<sup>1</sup> Sir Gilbert Blane : Diseases of Seamen.

<sup>2</sup> Surgical Lectures.

<sup>3</sup> Sir James Macgrigor and Mr. Boutflower.

that Baron Larrey performed amputation in Napoleon's European campaigns without success. It was fully tested after the battle of Toulouse, but failed.<sup>1</sup> In some cases a favourable change ensued, the spasms relaxing as soon as the soft parts were divided. In five of the cases which occurred in the Glasgow Infirmary, Dr. Lawrie observes that amputation was performed, but without relief.

The following table will show the nature of the injuries, &c., in twenty-four cases; fourteen unsuccessful, and ten successful:—

(a.) *Unsuccessful Cases.*

1. Male. Finger amputated on second day of the disease. Fatal.

2. Soldier. Wound of finger, tetanus, finger amputated. The disease made great progress after the operation. Death.<sup>3</sup>

3. Male, aged 17. Ring and middle fingers lacerated, the last phalanx of latter crushed. Seventh day, tetanus; eighth day, fingers amputated. Two days after operation, death.<sup>4</sup>

4. Male, aged 29. Lacerated finger; gangrene; amputation; dismissed well; thirty days after returned with tetanus; amputation. Death.<sup>5</sup>

<sup>1</sup> Rees's Encyclopædia : art. Tetanus.

<sup>2</sup> Latta : Practical Surgery, 1795.

<sup>3</sup> Cited by Welter : Thèse de Paris, 1815.

<sup>4</sup> Dr. Perry : Glasgow Medical Journal, 1831.

<sup>5</sup> Dr. Lawrie.

5. Lacerated index finger. Tetanus on fifth day ; amputation at the knuckle, but a terrific spasm occurred while dressing the stump, and death ensued in less than five minutes.<sup>1</sup>

6. Male, aged 14. Lacerated wound between finger and thumb ; tetanus ; amputation of hand ; the symptoms abated, and by the next day the opisthotonos had quite ceased, and the jaw could be easily opened. The disease returned, and he died eight days after the operation.<sup>2</sup>

7. Soldier. Pistol-ball through hand. Fourth day, tetanus ; amputation the same evening. Death on fourth day.<sup>3</sup>

8. Officer. Forearm shot away ; gangrene and arm above the elbow swollen and affected with convulsions, the muscles of the jaw were also affected, and mouth opened with difficulty ; amputation below the shoulder ; immediately afterwards unable to swallow. Death in three and a half hours.<sup>4</sup>

9. Soldier. Wound of elbow-joint ; tetanus ; disease far advanced ; arm removed ; relief followed ; but from exposure it returned, and death ensued on the third day after the operation.<sup>5</sup>

10. Male, young. Compound fracture of leg ; tetanus ; amputation ; the symptoms relieved ; the next morning they returned. Death.<sup>6</sup>

<sup>1</sup> Mr. McLellan : *Practice of Surgery*, 1818.

<sup>2</sup> Liston : *Edin. Medical and Surgical Journal*, vol. xxi.

<sup>3</sup> Cartier : *Bard, Thèse de Paris*, 1804.

<sup>4</sup> Faudacy : *Traité des Armes à Feu*, 1746, cited by Welter.

<sup>5</sup> Larrey.

<sup>6</sup> Dupuytren : *Traité des Blessures*.

11. Sailor. Leg fractured by heavy shot. Tenth day, tetanus; thirteenth day, amputation; immediate relief followed on dividing the soft parts; three hours after the operation he was taken with convulsive tremors, and died soon after from difficulty of breathing.<sup>1</sup>

12. Female, aged 20. Four months pregnant, thrown from carriage, and fractured leg; tetanus; amputation of thigh; the symptoms unaffected; death.<sup>2</sup>

13. Male, young. Compound fracture of leg; gangrene; premonitory symptoms of tetanus; amputation; the symptoms increased rapidly, and he died in twenty-four hours.<sup>3</sup>

14. Male, aged 47. Compound dislocation of ankle-joint. Second day, erysipelas of the leg; fourth day, premonitory symptoms of tetanus; amputation above the knee; before he was removed from the table, the disease had extended; death ensued in twenty hours after the operation, and twenty-four from the commencement of the disease.<sup>4</sup>

*(b.) Successful Cases.*

Dr. Hennen saw amputation remove the disease, but the patient died of fever. Mr. McLellan, in one case, states that amputation was followed by benefit; and Mr. Poland in a case of slight trismus that the patient recovered after amputation. Dr. Aberle<sup>5</sup> has recorded the case of a female, aged twenty, liable to cramps, who

<sup>1</sup> Howship: Medical and Physical Journal, vol. xxi.

<sup>2</sup> Dupuytren: Leçons Orales, tome ii.

<sup>3</sup> Sir B. Brodie: Medical Gazette, vol. ii.

<sup>4</sup> Mr. Macfarlane: Clinical Reports.

<sup>5</sup> Allgemeine Zeitung, für Chirurgie, 1843.



was taken in the month of February with symptoms of tetanic hysteria. On the 24th of May, she complained of severe pain shooting up the arm, from a piece of wood under the nail; from bathing the hand in cold water the pain increased, and tetanus set in. She was seen by Dr. Aberle, who considered that she was labouring under hysteria. She continued in nearly the same state for six weeks. The parts over the nerve were very painful, and when touched severe pricking pains were excited. By leeching, warm fomentations, and large doses of calomel and opium, she was at the end of three weeks better. She suddenly became worse. The finger was then amputated, and she immediately became better. A small splinter of wood was found sticking in the nerve.

1. Male, aged 24. Crushed index finger. The pain became severe, and in a few hours he presented all the signs of commencing tetanus; amputation was followed by immediate relief.<sup>1</sup>

2. Sailor. Contused and irritated wound of finger. Embrothotonos; finger amputated; bled, and tobacco enemas administered; the rigidity soon ceased.<sup>2</sup>

3. Male. Bruise of one of the fingers. Tetanus; amputation; the disease soon removed.<sup>3</sup>

4. Female, aged 7. Entered October 18th, with crushed finger. 23rd, in night, a tetanic fit; 24th, general rigidity; finger amputated; turpentine and assafoetida enema; tincture of Indian hemp, and cold to

<sup>1</sup> Mongellaz De la Nature et due Siège des affect. Convulsive, 1828.

<sup>2</sup> Mr. Alexander Medical Gazette, vol. ii.

<sup>3</sup> Curtis.

neck. In evening, rigidity the same ; 25th, at ten A.M. an exacerbation ; ice ; no access, but the rigidity continued ; on 31st she had no accesses, and the rigidity of the back had diminished.<sup>1</sup>

5. Male, aged 8. Burnt hand. On twelfth day, complete trismus and opisthotonos ; hand amputated ; the symptoms began almost immediately to diminish.<sup>2</sup>

6. Soldier. Compound fracture of humerus. Twelfth day, convulsions in shoulder ; sixteenth day, commencing tetanus increasing in severity ; evening, amputation ; symptoms relieved ; they returned, but he ultimately recovered.<sup>3</sup>

7. Male, aged 25. Elbow-joint shattered. Twenty-second day, trismus ; amputation ; four days after operation he was able to open his mouth ; cure.<sup>4</sup>

8. Officer. Large bullet-wound of left knee. Twelfth day, trismus ; the second day after the operation the trismus had ceased.

9. Male, aged 11. Leg severely crushed. Thirteenth day tetanic symptoms ; on fourteenth, they were fully developed ; amputation ; fifteenth, the tetanus gone ; death from phlebitis.<sup>6</sup>

<sup>1</sup> Miller : *Edin. Monthly Med. Journal*, 1845.

<sup>2</sup> Wayte : *Edin. Med. and Surgical Jour.*, vol. xvii.

<sup>3</sup> Lesaive : *Thèse de Paris*, 1815.

<sup>4</sup> Hutchinson : *Med. and Physical Jour.*, vol. xxii.

<sup>5</sup> Ploche : cited by Pelissier.

<sup>6</sup> Case of Mr. Bransby Cooper's : *Dublin Med. Jour.* 1850, case 44 of Mr. Poland.

10. Officer. Bullet-wound of foot. Tetanus set in, it become chronic; opium given, and some pieces of bone removed; the symptoms disappeared and reappeared; amputation; the symptoms gradually declined.<sup>1</sup>

2. *Removal of Irritants.*—John Hunter removed some pieces of bone from the arm in a case of compound fracture, with relief; the patient continued to improve up to the sixth day, when he fell into a fit and expired. Stutz removed some pieces of bone from the shoulder in a case of gunshot wound, with relief to the symptoms; from the formation of an abscess the legs were seized with convulsions, but as soon as it was opened they ceased. Larrey mentions a case in which pieces of bone were removed from the hand, a calm ensued; from exposure, the disease returned, but he ultimately recovered. Mr. Travers, in a case of gunshot wound of the hand, with fracture and dislocation of the wrist, opened an abscess in the forearm, with immediate relief to the symptoms; in another case, the symptoms yielded on free incisions being made into the buttock, matter escaping. He also mentions a case in which the removal of the ligature from a large nerve allayed the symptoms. Burmeister<sup>2</sup> has recorded a case in which the sudden appearance of gangrene in the wound was followed by relief, although salivation had been induced without benefit.

<sup>1</sup> Larrey.

<sup>2</sup> Medico-Chir. Transactions, vol. ii.

3. *Division of the nerves going to the wound.*—

Cullen observes that when the disease arises from the lesion of a nerve, cutting off that part from all communication with the sensorium, might cure it. Collins<sup>1</sup> states that it had been tried among the negroes without success. Dr. Jackson divided the posterior tibial nerve in two cases of wounds of the feet, with a similar result. Mr. Poland states that the anterior and posterior tibial nerves were divided in one of the cases, but it ended fatally. Dr. Murray,<sup>2</sup> in a case of compound fracture of the tibia and fibula, divided the nerves, with a similar result. This gentleman divided the posterior tibial nerve in a male, aged fifteen,<sup>3</sup> who was seized with trismus and commencing rigidity from puncturing his foot with a nail; he was able to open his mouth immediately after the operation, and recovered rapidly. Professor Pechioli<sup>4</sup> divided the nerves in two cases with success. In one case the patient, a male, about sixteen, who had injured one of his feet, he laid bare the saphena nerve in the foot and removed a piece of it. The pain in the wound (before very severe) was immediately relieved, and the tetanic symptoms diminished. In the second case the patient, a male, aged thirty, had cut his foot with an axe. He was seized on the third day with trismus, and then opisthotonos; the saphena nerve was divided, but higher up; the relief was not so immediate as in the other case.

<sup>1</sup> On the Management of Slaves, 1803.

<sup>2</sup> Medical Gazette, vol. xii.      <sup>3</sup> Ibid, vol. xi.

<sup>4</sup> Bullet. delle Societ. Med. di Bologna, 1841.



4. *Cauterizing the wound.* — Larrey applied the cautery several times to a wound of the face. At the time of application it increased the convulsive contractions, particularly of the muscles of the face, larynx and pharynx; but relief followed, which lasted for two or three hours, when the symptoms returned. The patient died on the seventh day. Valentine<sup>1</sup> applied the cautery to a wound on the foot, in a negro suffering from trismus; he recovered. Celières,<sup>2</sup> to a wound of the shoulder, in a soldier suffering from tetanus; he suffered severely during its application, and had convulsions; but a general calm followed, and he recovered. Welter applied it in three cases with success, and he states that Girandi also used it in three cases, with the same result. In one of Welter's cases the patient, a soldier, had been seized with trismus from a wound of the hand; the cautery was applied; six hours after its application he was better, and on the third day the trismus disappeared. In the second case, the arm had been shot away and amputation had been performed. On the fifth day, the patient complained of severe pain in the wound; on the sixth rigidity existed; on the seventh trismus and difficult deglutition; on the eighth the symptoms had increased—the cautery was applied. On the ninth the symptoms had diminished. In the third case the patient was seized with tetanus after a flesh-wound of the arm; the cautery was applied and opium given. The same day the contractions diminished, and

<sup>1</sup> Jour Gén. de Médecine, tome xl.

<sup>2</sup> Thèse de Paris, 1810.

by the third they had disappeared. Borrelli<sup>1</sup> applied the cautery to a sensitive spot on the palm of the hand, consequent on a fall, with benefit.

5. *Applications to and incising the wounds.*—Caustic and irritants have been frequently applied. In a few cases the latter, when the wounds had ceased to discharge, were of some service; but generally both have been found of little service. Some writers considered that they sometimes excited the disease. Several West Indian writers have spoken of poultices of the green tobacco leaf as an excellent application.

Belladonna, aconite, and opium have been applied, but without any marked influence on the symptoms. Ice has also been used, but with a similar result; it seems to have been only applied to the wound. Hydrocyanic acid has been applied with temporary relief. Triezwart<sup>2</sup> injected it into the cellular tissue, and each time it was followed by a cessation of the cramps.

The wounds have been freely incised. In some cases the symptoms have been aggravated, either from fear or the pain which they excited. In a case recorded by Larrey, dividing some "fibrous or nervous filaments" in the wound was followed by relief.

6. *Applications to the spine*—The spine has been cauterized with a red hot iron, a line being drawn down each side of the spinous processes from the occiput to the sacrum, generally with considerable relief to the

<sup>1</sup> Cited in *Bullet. Gén. de Thérapeutique*, 1853.

<sup>2</sup> *Chelius's Surgery*, translated by Mr. South.

symptoms, and patients, if the application has not been too long delayed, have frequently recovered. Blisters, counter-irritation, and opiate liniments and ice, have been applied ; but they have rarely been followed by any marked benefit in severe cases. A few authors have found them of service in subacute and chronic cases. Cupping, leeching, and deep and free scarifications, have been used ; but seldom with more (except in inflammatory cases) than temporary relief.

7. *General bleeding*.—Blood has been abstracted in large quantities, in some cases with marked and permanent relief, in others the relief has only been of a temporary nature. When the disease is of an inflammatory character and the patient strong and robust, bleeding seems to be of service ; but when it arises from local irritation, its employment, from reducing the constitutional powers, seems to hasten the fatal termination.

8. *Mercury*.—Among the natives of India, the employment of mercury has seldom been attended with any benefit ; the same has been observed in Europeans whose constitutional powers have been much reduced by overwork or previous disease. Two instances have been recorded of the disease occurring during salivation. A great number of authors have spoken highly favourably of it. In inflammatory tetanus, it must, I think, be considered as the remedy on which the most reliance is to be placed. I am not acquainted with an instance of idiopathic tetanus which has terminated fatally after salivation has been induced. The great obstacle to its use is the difficulty of introducing it into the stomach,

and even when this has been effected, it is sometimes questionable if it has been absorbed. It should be introduced into the system through the skin ; gloves and stockings smeared with the ointment being worn, and the body rubbed incessantly with it, until ptyalism is excited. To be of service, it should be used early, and other remedies, such as opium in large doses in a liquid form, with chloroform inhalations from time to time to mitigate the severity of the accesses, should be employed. The strength should also be supported by essence of meat, wine or spirits. If they cannot be introduced into the stomach, they should be injected into the rectum.

9. *Opium*.—There is no remedy which has been found so useful as this, whether alone or in combination with others. It should be given in a liquid form and in large doses, at short intervals, until an impression is made on the disease. During the latter part of the last century, it was given in combination with carbonate of potash ; warm baths impregnated with potash being also used. This treatment, first tried by Stutz, was suggested by some experiments made by Humboldt, who found that potash allayed the irritability of muscular fibre. This method of treatment was employed by other practitioners. About fifteen cases have been recorded in different continental journals and works, in all the termination was successful.

10. *Indian Hemp*.—This remedy has been used extensively, both in this country and in the East Indies. Several isolated cases have been recorded in which its employment, either in the form of tincture or extract,



was attended with success. Mr. Peet, who used it largely, does not consider that it possesses any superiority over opium.

11. *Belladonna, aconite, and hydrocyanic acid*, have been used more or less extensively, but without any permanent benefit. *Coculus indicus* in the form of infusion might, I think, be found of service.

12. *Tobacco and tartar emetic*.—Tobacco and tartar emetic enemas have been used with variable success. They have arrested the disease at the onset, sometimes immediately, sometimes only while the system was under their influence. Ether and chloroform have caused them to be laid aside.

13. *Chloroform*.—No remedy possesses so much influence on the disease as this. It should, however, I think, be looked upon as a temporary agent, and used to allay the severity of the disease until the system can be brought under the influence of opium and mercury. It should be employed early in the disease, and the patient should not be frequently or too deeply narcotised. The symptoms which contra-indicate its use are, great difficulty of breathing, great rapidity (ranging from 130 to 140) or slowness of the pulse, coma, or cerebral excitement. I have known it to cause death in a short time in cases of this kind. The practitioner, however, must be guided more by the general symptoms than by the pulse, which may only be extremely quick or slow during the accesses.

14. *Warm and cold baths*.—Warm baths have been generally used with considerable relief, the patients being

allowed to remain in them for some time. In the latter stage of the disease, they have sometimes induced sudden exhaustion, and the patients have died in them.

Ambrose Paré buried a patient up to his neck in a dunghill; he recovered. Francois states that one of the crew of a French man-of-war recovered by being shut up in the hold for several hours—he sweated copiously. When taken out he was quite free from the disease, but very weak. It is probable that enveloping the patient, first in a hot wet blanket, and then in several dry ones, might be of service. I have employed this plan in the early stages of fever, the cold stage of ague, in rheumatism, and several other affections in which it was desirable to induce copious perspiration, with marked benefit.

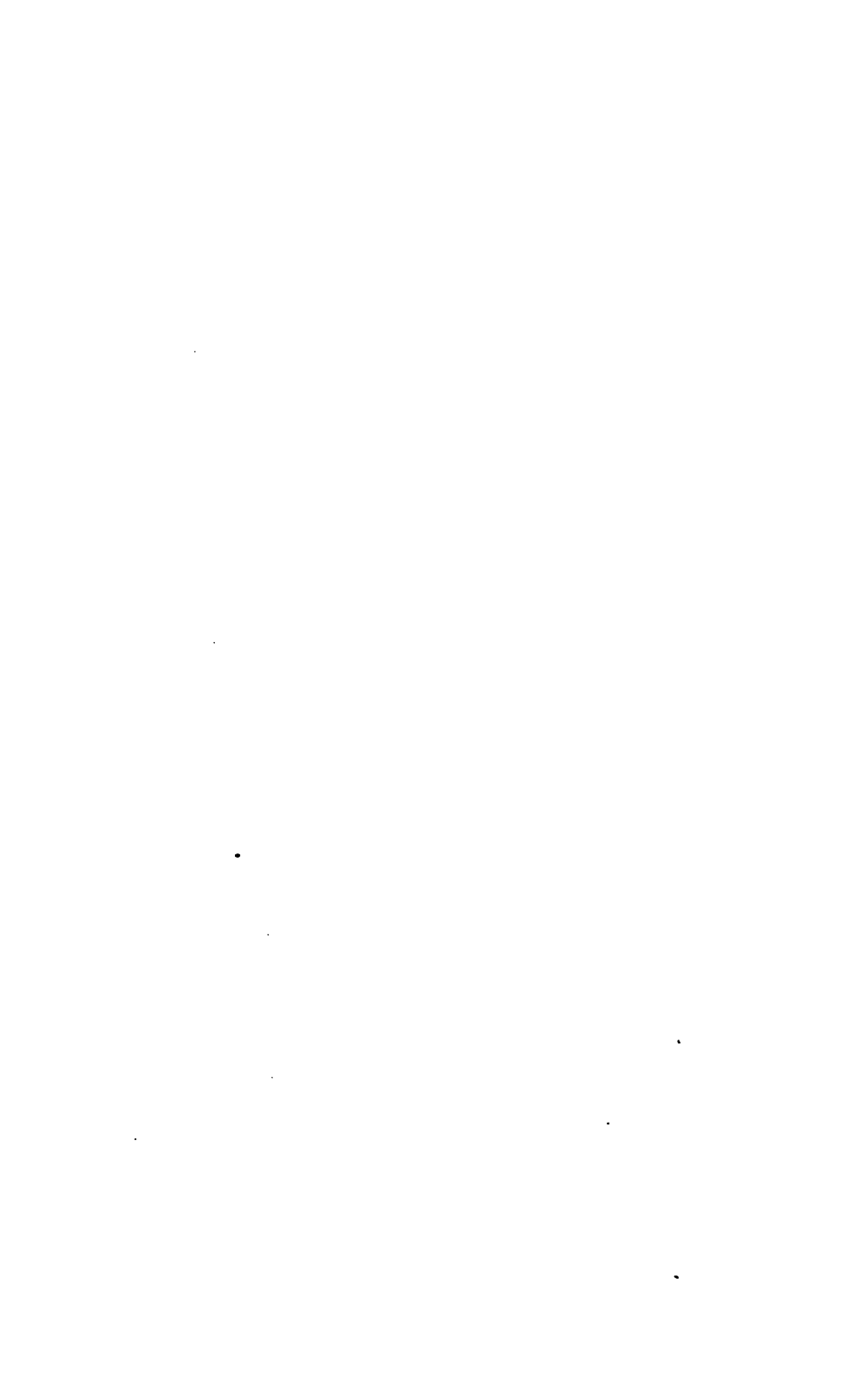
The cold bath, so highly extolled some years ago, has fallen into disuse. In the East and West Indies it was found to hasten the fatal termination.

15. *Purgatives*.—It is essential that the bowels should be freely acted upon; therefore a large dose of croton oil should be given as early as possible, and repeated if necessary.

16. *Diet, &c.*—The patient's strength must be supported. Essence of meat and wine or spirits should be given freely. He should be kept perfectly quiet in a darkened room; noise, or anything likely to excite or irritate him, being carefully avoided.

Patients have frequently recovered under dietetic measures alone, no remedies, or those of the most simple and inert kind, having been used.

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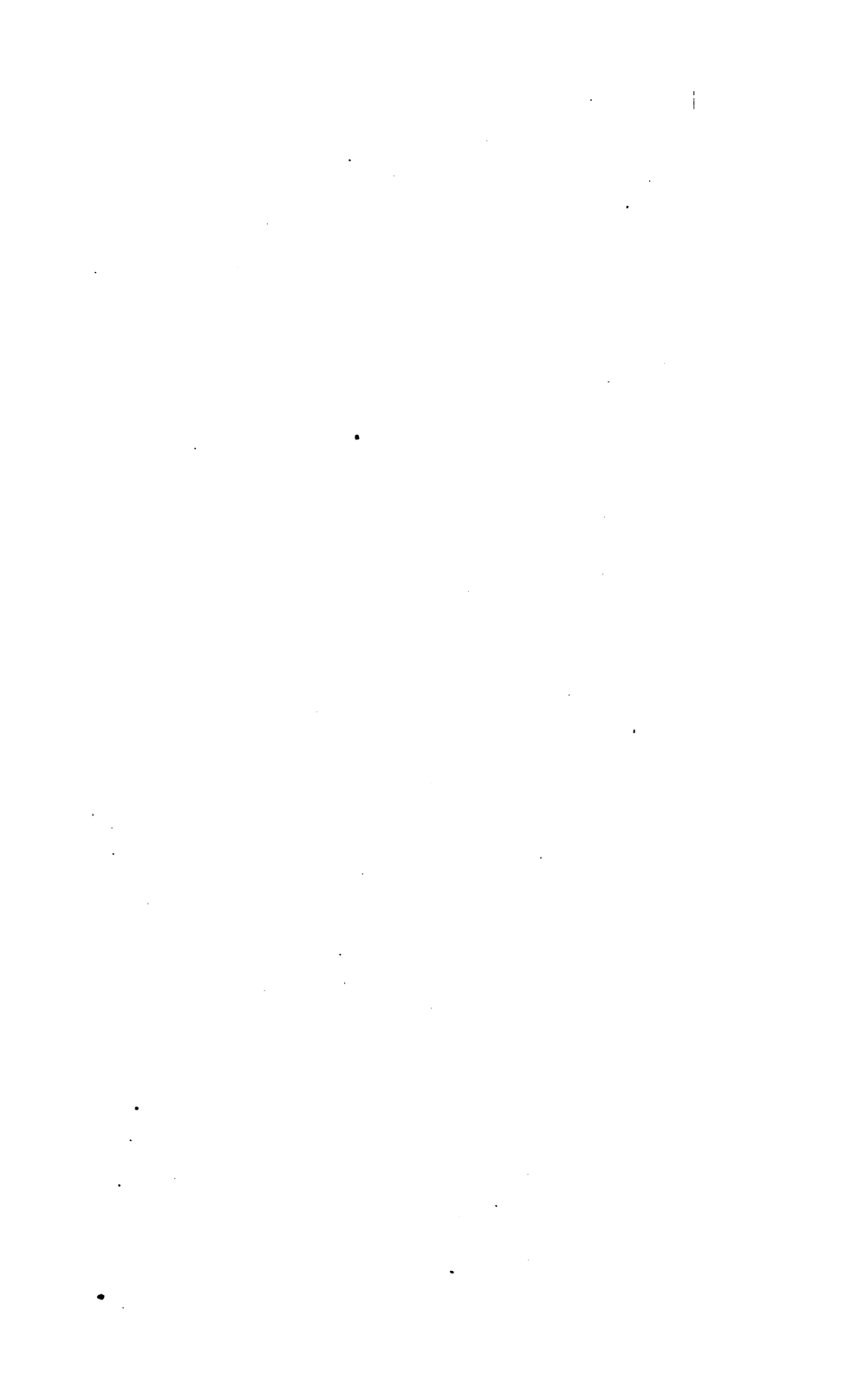
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